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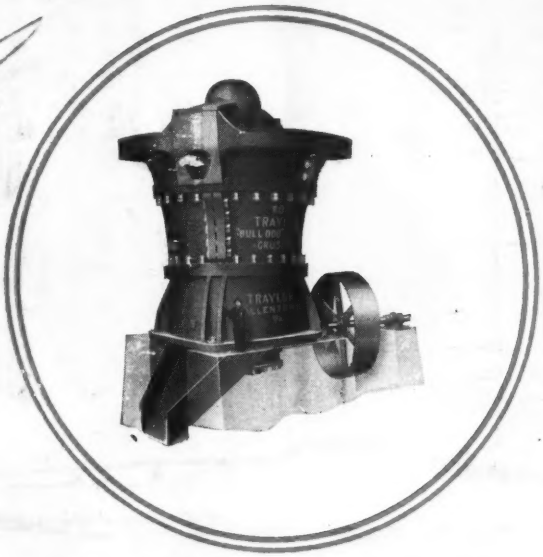

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October 1, 1924

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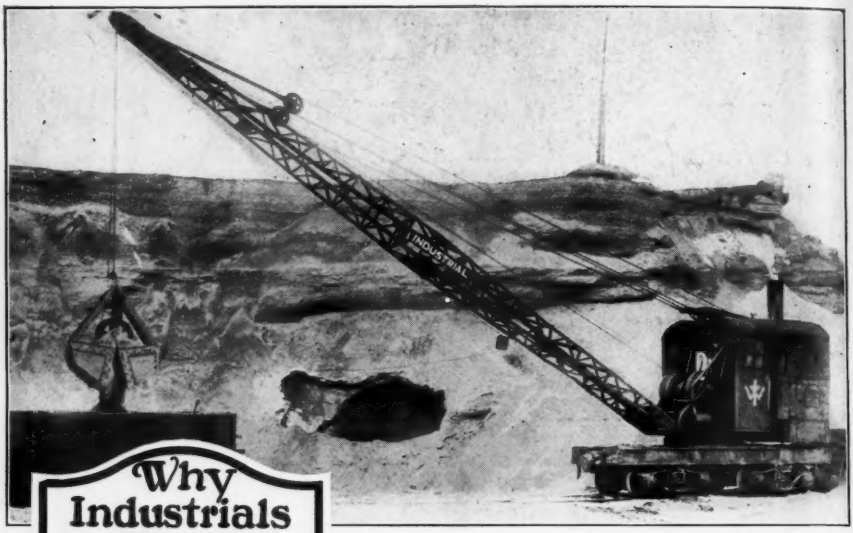

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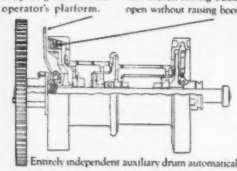

Entirely independent auxiliary drum automatically controls bucket opening line without lever or power from other drum; gives two lines for erection or dragline work.

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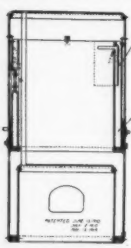

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Fifty men for $24 a day—

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LOCOMOTIVE CRANES

Pit and Quarry

A Semi-Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

VOL. 9 CHICAGO, ILL., OCTOBER 1, 1924 NO. 1

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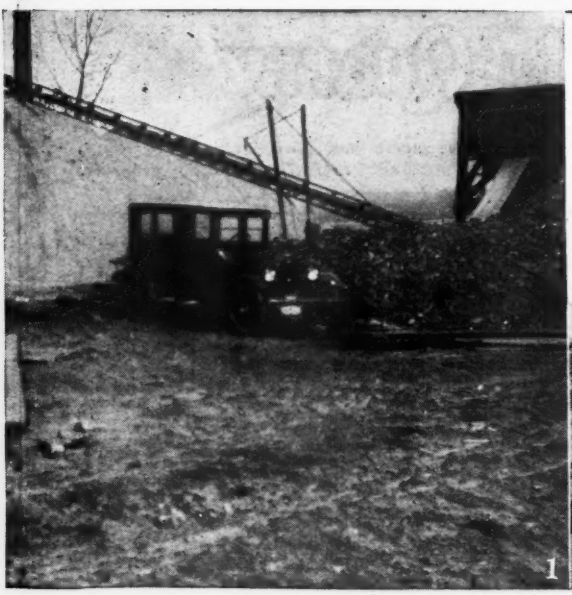

1—The Barber-Greene Conveyor, working for Ulster Davis, builds winter storage for brick yards along the Hudson River.

2—One of the two Barber-Greene Type U Conveyors used in Gus Albright's sand and gravel pits, Montgomery, Ill. They keep four trucks constantly on the move. With two men shoveling, a Type U loads a truck in four or five minutes.

Cutting labor overhead to the bone

With barges, hoists, and a Barber-Greene Conveyor, Ulster Davis, of Rensselaer, N.Y., developed an entirely new business. He is furnishing sand, gravel and crushed stone to brick yards along the Hudson River, for their winter stock piles.

As Mr. Davis' work is entirely a material-handling job, his success depends largely upon the speed and dependability of his conveyor.

The clam shell takes the material from the barge and stores it in a bin on the docks. Storage capacity has been increased immeasurably by the use of the conveyor, which takes the material from the bin and stores it well back in semi-circular piles.

With this equipment and 4 men, Mr. Davis handled between 300 and 400 cubic yards in a day. During 100 working days in 1923 the conveyor handled 1,000 to 1,200 cubic yards, with a total repair expense of $5.00.

Today, with unskilled labor costs where they are, hundreds of other businesses are finding Barber-Greenes their one best means of cutting their labor overhead to the bone, at the same time increasing production. Catalog N holds much important data on this subject. Send for it.

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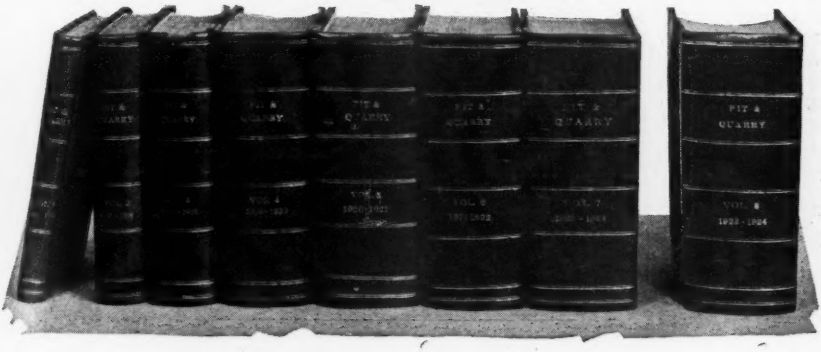
Portable Belt Conveyors Self Feeding Bucket Loaders

Coal Loaders . . Automatic Ditch Diggers . . Coal Feeders

Pit and Quarry

Vol. 9 Chicago, Ill., October 1, 1924 No. 1



Pit and Quarry Now Semi-Monthly

THIS number of PIT AND QUARRY is the first number of Volume 9. Hereafter PIT AND QUARRY will be published semi-monthly on the 1st and 15th of each month. The above illustration shows a consistent growth due to the steady increase in advertising volume. With this increase in advertising patronage has come higher and higher editorial standards. Simultaneously with the growth of the publication there has been a continuous extension of its circulation.

Now, with the increased space for editorial service, incident to semi-monthly publication, an even better and more inclusive editorial service will be rendered the pit and quarry industries—sand, gravel, stone, cement, gypsum, lime and other non-metallic mineral producers and manufacturers.

A magazine, if it is what the name suggests, is charged with information and ideas. Its circulation constitutes a group service. This service is primarily for its readers. Its circulation is offered to advertisers as a medium of access to its readers. The extent of circulation, therefore, theoretically determines the degree of service to both readers and advertisers. To serve a given trade, class or profession in its entirety is, obviously, the ideal service.

PIT AND QUARRY has long served the entire industrial field through its free and complete distribution, and has thus afforded manufacturers and dealers a medium of universal contact with its readers.

Thus it has won generous patronage of advertisers, with the result that its advertising section is a most complete and representative Buyers' Reference.

Likewise its indiscriminating methods of editorial service has engendered the great good-will of its readers, most sincerely appreciated by the publishers and valued by the advertisers.

The principal motive in the future will be as it has been from the beginning, the advancement of the whole of the trade rather than of a fraction of it.

The publishers also deeply appreciate the splendid cooperation of individual operators with the Editor of PIT AND QUARRY, thus enabling the publishers to realize their policy to serve the whole trade not only through complete distribution, but also by editorial treatment of such subject-matter as is of most general interest.

494158

Foreign Control of Raw Material

THERE is need for legislative action in dealing with control of foreign monopolies of imported raw materials. Some time ago a bill to meet this need was introduced into Congress by United States Senator Arthur Capper.

Foreign combinations control many products that are needed by American agriculture and industry. Since these combinations are not controlled by our laws governing monopolies in restraint of trade, they present a real menace. Secretary Hoover has given the problem his attention and believes that some relief may be secured through legislation.

Congress has made an appropriation in order to have the Department of Commerce investigate raw materials which are essential to American industry and which are under control of foreign interests. It is evident that these foreign monopolies control prices and distribution.

One of the products thus controlled is sisal for binding twine. This is dominated by a combination that is backed by the Yucatan Government. A British selling agency operating under export laws in Chili controls the nitrates and iodine. German producers control potash and British and Dutch colonies handle crude rubber and gutta percha. A combination of British producers controls tin.

Secretary Hoover believes that American consumers should be allowed to establish common purchasing agencies for these imported materials which are controlled by combinations. In this way the purchasing would be the controlling factor. A combination of buyers would offset the power of the combination of producers. An amendment to the Webb-Pomerene Act would make this possible. Certainly the problem calls for a wise and practicable solution.

The Eight and Ten-Hour Day

DURING the year 1923 the twelve hour day was cut to an eight and ten hour day in the steel plants. This change had long been sought by those interested in the welfare of the working class. Others had been dubious about the results of such a change. The records of the year's business are significant and seem to warrant the opinion of those who maintain that improving conditions for employees is a paying proposition.

The output of the United States Steel Corporation in 1923 was 147,000,000 tons of material valued at $1,571,414,000. After all charges including taxes and improvements were deducted, the net profit was $108,707,064. The total business for 1923 exceeded that of 1922 by $500,000,000. The sum spent for improvements in 1923 exceeded that of 1922 by $41,000,000. The corporation piled up a surplus of $512,751,220 with $508,302,500 in common shares outstanding. The current assets were increased by a total of $76,400,000. All of the large steel plants are now operating on the eight and ten hour day basis and report definite programs of expansion. Net profits are running high in the millions.

Publishing Income Tax Returns

SHALL Federal income tax returns and files be a matter of public record? It is probable that a vigorous effort will be made to secure the passage of such a bill in the next session of Congress. This has been rejected by Congress and is not approved by the Treasury Department. It would involve investigators and a publicity of the private affairs of the tax payers which to many of them appears to be objectionable.

Those who are opposed to the measure contend that its advocates consist largely of people who are not required to file returns of income and who pay no income taxes because of personal exemptions and deductions. If any personal records are published, all people with incomes should be required to file returns.

Fewer than 8,000,000 persons are required to file returns and pay income taxes. More than 20,000,000 file no statements. The opponents of the bill object to legislation which gives 20,000,000 persons access to the returns and records of the 8,000,000 who carry the burden of the income tax. Such publicity of the private affairs of the tax payers appears to be a discrimination which is based on a principle that is fundamentally unsound.

An Efficient Eastern New Jersey Washed Sand and Gravel Plant

The Cedar Grove Sand and Gravel Company of Cedar Grove, N. J. Generate Electric Power—To Manufacture Concrete Products

Written expressly for PIT AND QUARRY by DONALD D. BARNES*

TO supply the constantly growing demand for washed sand and gravel in the vicinity of Paterson, Montclair, Bloomfield, and neighboring cities in New Jersey, the Cedar Grove Sand and Gravel Company has erected and has in operation a very modern and efficient sand and gravel plant.

The pit is located on the Little Falls Road below Pompton Ave., between Cedar Grove and Little Falls, New Jersey, and comprises about 54 acres of good sand and gravel. The material averages about 30 per cent gravel and 70 per cent sand. The sand is of a very good quality, being sharp and of good color and the gravel is hard and durable. There is perhaps 5 to 8 per cent of oversize gravel that will require crushing. The material after going through the Telsmith washing plant, according to reports from the State and Pittsburgh Testing Laboratories, tests out highly. It contains less than one per cent of loam, and briquettes made, after 7 days, showed an average tensile strength of 313 as compared with a tensile strength of 263 for Ottawa Sand. This is particularly interesting, due to the fact that although the pit has quite a heavy overburden, no stripping is done. Everything, including the overburden, is washed through the plant and the washing equipment turns it out very clean.

Considerable time was spent by the members of this company investigating various methods and plants before buying any equipment. They finally decided on a complete Telsmith plant furnished by the Smith Engineering Works of Milwaukee, who also designed the plant.

The pit is in the form of a bank extending back from the receiving hopper of the plant. A three yard Green power drag scraper is used to cut into this bank and convey the material from the pit to the receiving hopper.

Beneath this hopper and driven from the foot shaft of the conveyor is a Telsmith 24 inch wide by 6 feet plate feeder. This feeds evenly a 24 inch Telsmith belt conveyor 134 feet centers which in turn discharges onto a Telsmith 3 x 5 foot Arrow Bar grizzly screen at the top of the plant. This grizzly has 2¼ inch openings between the bars and

*New York District Manager, Smith Engineering Works.

A General View of the Plant and Power House.

all gravel over this size is rejected and conveyed by a chute onto a pile. When the operation was started it was not known just how much oversize rock would be encountered. This has now been definitely determined and an additional bin to take this oversize rock is being built under the main conveyor. A Telsmith number 6A Crusher will be set under this bin to crush this oversize rock and a short conveyor will return it to the main conveyor where it will again be returned to the grizzly.

The material from the main 24 inch conveyor going through the grizzly screen falls into a receiving and washing box. Here the water hits the sand and gravel and washes it by means of a flume into a 48 inch by 18 feet Telsmith heavy duty washing screen. About 600 G. P. M. of water is used and is pumped from a nearby stream by means of a Worthington 5 inch discharge centrifugal pump directly connected to a 30 H.P. motor. The Telsmith screen is equipped with a scrubbing section, sand jacket and two gravel screening sections. After being scrubbed, the sand and water separate from the gravel, going by means of a flume; to two number 6 Telsmith automatic steel sand settling tanks which separate out the concrete or coarse sand. These overflow into one number 7 Telsmith automatic tank which separates out the fine sand. The dirty water overflows into a flume and after passing through a series of settling basins, goes back to the stream.

The gravel remaining in the screen after the sand and water have left it, is thoroughly rinsed by a spray pipe to remove any particles of sand and is then separated into three sizes and conveyed by a chute into bins.

When the sand bins are full, the tanks can be discharged into a stock pile alongside the bins. The stock pile material is reclaimed by means of a Haiss portable truck loader.

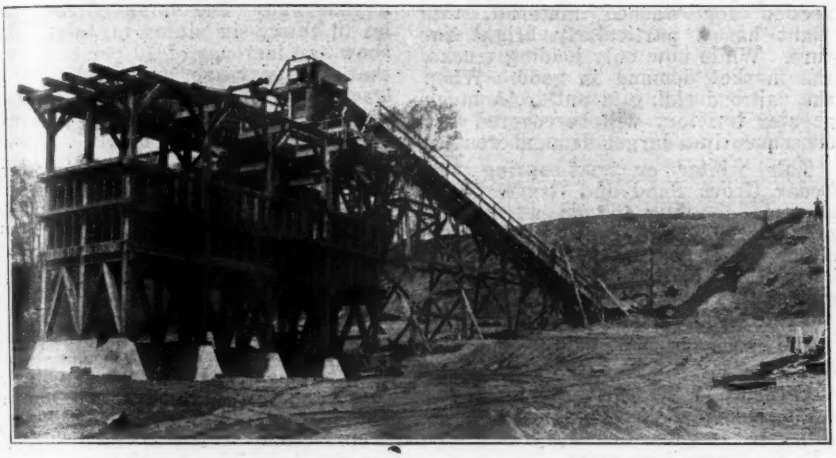
The present plant is arranged in such a way as to allow the future installation of another washing screen and set of tanks thus doubling the present capacity which is about 50 cubic yards per hour. The drag scraper, feeder and conveyor were originally planned to take care of this future increase in capacity. The one motor on top of the bins, which is 50 H.P. and which drives the Telsmith washing screen, 24 inch belt conveyor and feeder is plenty large enough to drive the complete plant when the second washing screen is added.

As can be seen from the cuts, the plant is exceptionally well built and the original design was followed to the smallest detail. Great credit is due Mr. Joseph Stuckey, who built the plant. This gentleman has had considerable experience in construction work, and working under very adverse weather conditions in the spring of the year, he built a road into the plant, a bridge over the stream and put up the plant in record

Interior View of the Power House.

time and at a very reasonable cost. The efficiency of Mr. Stuckey's work was illustrated when all the machinery including the gravel feeder, 24 inch belt conveyor and washing screen, was belted up together. It was found that one man could turn all this machinery over by hand. When the power was turned on, everything started without a hitch and has been operating daily since that time.

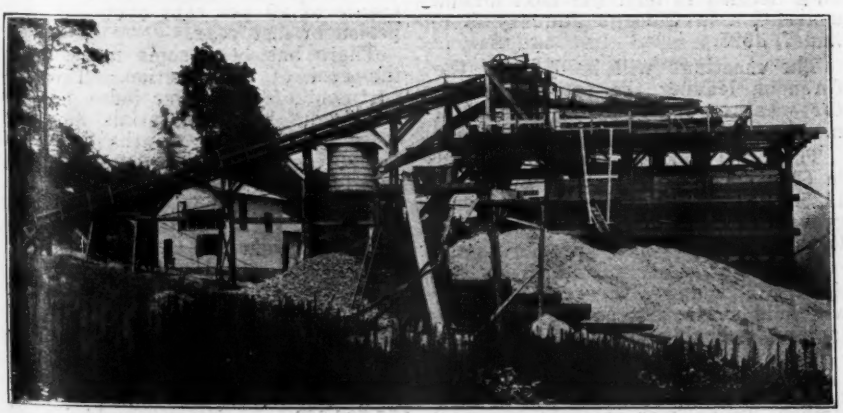
A rather unusual feature of this plant is the fact that their own electric power is generated right on the ground. The power plant contains a 185 H. P. Venn-Severin semi-diesel type oil engine, directly connected through a clutch to a Thomas hoist. This hoist operates the 3 yard Green drag scraper outfit. The engine pulley is belted to an electric generator outfit capable of supplying sufficient current to drive the gravel washing and screening plant and the centrifugal water pump. The Venn-Severin engine is one of the latest designs and has proved exceptionally efficient. Only one man is required in the power house. He not only operates the hoist for the scraper but also takes care of the rest of the power plant.



A View Showing Pit In Form of a Bank.

Altogether about five men are required to take care of the operation of the plant, including the hoist operator, the men who take care of the plant, loading the trucks and checking the trucks out at the office when they are leaving with a load.

For the present this plant is for truck loading only but later on it is



A View Showing Reject Pile.

planned to run a railroad siding into the plant to take care of additional material to be shipped by railroad. The Erie Railroad is only a few hundred feet away from the plant. It is estimated that the pit contains about 80,000,000 cubic yards of workable sand and gravel and with the continually growing demand around this section for washed material, this plant has a particularly bright future. While now only loading trucks, the market demand is good. When the railroad siding is put in, a much greater territory will be covered and consequently a larger demand created.

This winter or next spring the Cedar Grove Sand and Gravel Company is planning to add a concrete products plant. When this is done, either a belt conveyor or derrick will be installed to transport material direct from the gravel plant to the concrete products plant.

The incorporators and members of this company are as follows:

Anthony M. Ferrary, President.
Wm. Shears, Vice-President.
Jos. M. Degnan, Secretary.
R. G. Buser, Treasurer.
Joseph B. Stuckey, General Supt.
Wm. A. Parkhurst.
W. A. Fisher.
George B. Canfield.

The authorized capital stock of this concern is $250,000.00, of which $60,000.00 has been paid up.

Sand and Gravel Convention

The Board of Directors of the National Sand and Gravel Association at a meeting in Chicago September 16th decided to hold the next annual convention in Chicago January 5, 6, and 7, 1925.

The meetings will be held in the forenoon leaving the afternoon free for whatever purpose the individual members care to use them for.

The Good Roads show will be held in Chicago January 5, 6, 7, 8, and 9, 1925. This will enable the sand and gravel producers to take in the Good Roads show.

The executive committee of the National Sand and Gravel Association will hold a meeting at Terre Haute, Indiana, probably October 21st.

The Columbus Gravel Co., of Columbus, Texas, was recently incorporated for $20,000 by L. T. Everett, E. C. Miller and J. J. Everett.

The Building Situation

IN view of statements current in some portions of the press that a depressed condition exists in the construction industry, the Department of Commerce has issued a statement calling attention to the immediate situation as compared with conditions a year ago. The value of contracts let in thirty-six states in July, 1924, shows an increase of 10 per cent over that of a year ago, and the total contracts let from January 1 to the end of July, 1924, also gained 10 per cent over the same period of 1923. Practically all classes of construction contributed to the increase, although in varying degree, just as there has been relatively greater activity in some cities and districts than in others.

Residential contracts for July this year show an increase of 3 per cent over those of last July; industrial and commercial building combined show 3 per cent increase; public works and utility construction 10 per cent increase; educational buildings, 26 per cent increase; and miscellaneous, including hospitals and institutions, religious and memorial buildings, and public buildings, 42 per cent increase.

Cement shipments from the mills in July increased 21 per cent over the same month last year, and for the seven months ending July were 4 per cent higher.

Although there was some decrease in lumber production during the first seven months of the year, orders for lumber reported by eight leading associations during six weeks ending the middle of August show an increase of 29 per cent over the same period of last year.

There has been some recession in the cost of construction. The Department of Commerce index number for frame house materials shows a decrease in twelve months from 214 to 199, compared with 1913 as 100, and for brick house materials, from 217 to 201. Other index numbers show a decrease in general construction costs from 222 to 214.

Manufacturers' reports covering the first seven months of 1924 show that 150,319,014 pounds of high explosives were sold for consumption in the United States. This reported quantity indicates that approximately 157,706,000 pounds were sold by all companies, including companies that do not report monthly.

The Limitations of Anti-Trust Laws

By JESSE W. BARRETT, Attorney-General of Missouri*

IT IS the purpose of this article to call attention to the economic laws controlling trusts and business combinations and to point out that statutory regulations are only in supplement thereto. Every Attorney-General must consider the economic as well as the legal aspect of each case and in a sense at least must be an economist as well as a lawyer.

From the earliest beginnings, trade and commerce have been the mirror of human nature. The sellers invariably exact from the buyer as high a price as they can get, while the buyers are equally zealous in their efforts to buy as cheaply as they can. Given both free supply and free demand, each unhampered by any artificial restraints, the price gravitates to a point which is fair and just to all concerned. When price is regulated by the free operation of the law of supply and demand, the result is far more exact justice than can ever be attained by governmental price regulation.

A just and fair price satisfies neither buyer nor seller if a more advantageous price can be had. Each group therefore would like to supersede the law of supply and demand with some more profitable arrangement, but the buyers are rarely able to interfere with natural laws by any combination between themselves. Theoretically, they could combine and fix price, but practically they cannot. With the sellers, however, there are often many conditions which make combination easy.

Ancient Attempts at Price Regulation

Governmental price regulation is anything but a modern experiment. As early as 301 A. D., the Edict of Diocletian gave the Emperor power to fix maximum prices, the penalty for violation being death. Similar decrees were issued by Emperor Julian in 361 A. D. Clive Day in his History of Commerce says, "In the middle ages, innumerable attempts at public regulation, covering practically all wares, were made at different times and places. Most of them were soon given up because they defeated their own object. When the price was set too low, the ware was no longer offered and people suffered more by going without than by paying the higher price. Thus it was found unwise to set a price for a necessity like wheat, and high wheat prices were allowed to work their own cure by the inducement they offered to an increase in supply."

In the thirteenth century, the English authorities laid down the principle of *justum-pretium*—that only a just or reasonable price should be paid. The regulations establishing the just price were made alike by local authorities and by the central government.

The American colonies regulated the price of wages, bread, merchandise, ferriage, mill tolls, wharfage, coal, ale and attorneys' fees. The French Revolutionary government likewise assumed authority to fix prices on all necessities of life. All of these schemes for price regulation resulted disastrously. It was about that time when Adam Smith published his theories and public thought began turning to the right of the individual to an unimpeded sphere for the exercise of his economic activity. Competition began to be recognized as the great price regulator.

Step by step public policy developed until **the principle became settled that the most which statutes ought to do is to prevent the slightest interference with the natural workings of the economic law of supply and demand.** The public policy of the statutes today is to keep hands off business as far as possible and to leave the solution of problems to natural laws wherever natural laws will within themselves work a cure. Anti-trust laws therefore have a negative rather than affirmative character. On the contrary they preserve the public good by guaranteeing competition to the fullest and freest extent.

Public Confused About Price Competition

Of course to this general statement must be noted the exceptional class of cases. There are some instances where competition cannot be had without great duplication and waste. Most public utilities, for instance, are natural monopolies. An absolute monopoly is entirely free from the law of supply and demand and if it sells a public necessity, price regula-

*An address delivered July 7, 1924, before the National Association of Attorneys-General.

tion by government is imperative for public protection. As society progresses, the number of public utilities requiring state regulation as to price constantly increases. Here the action of government is affirmative, but in anti-trust cases, as we have said, its action is merely negative—the prohibiting of interference with economic laws.

Certainly the public mind is confused regarding these principles, however well our own membership may understand them. All of the Attorneys-General have repeated complaints and requests for official action whenever a price war occurs. There seems to be a general impression that competition must be restrained. I recall that at one of our recent conferences, one of our own members made the statement that he was seeking light as to the situation regarding gasoline and oil; that he had heard the Standard Oil Company was about to start a price war in his state and that he intended to be ready for them and make them suffer if they did. Genuine price wars are exactly what the settled public policy of the states tries to preserve.

Uniform Prices Due to Competition

Further, all of us are overwhelmed with complaints when in any given line of trade, prices are uniform and **it is the general public impression that uniformity of price necessarily presupposes price agreement.** The farmers of the nation, however, have no price agreement, yet the price of wheat on a given day and at a given place is invariably the same for all sellers.

That is not due to restraint of competition. It is due to the fullest and freest competition.

As John Stuart Mill said in his Principles of Political Economy:

> "It is axiomatic that there cannot be for the same article of the same quality two prices in the same market, assuming that both the buyer and the seller take pains to know what that price may be."

Competition is the great evener. Instead of the level price being prima facie evidence of control, the reverse is true.

The level price is the regular order of the day where competition prevails. It is just as inconceivable that you can have two levels of water in a set of communicating tubes as it is that you can have two levels of prices in communicating markets. The freer the flow of water among the tubes, the sooner the same level will be reached in all tubes.

Open Price Associations

The supporters of the "Open Price Association" plan had some such principle in mind when they claimed that the exchange of statistical information between competitors promoted competition. Men like Hurley, Eddy and others wrote of it in glowing terms. The prices, however, were open to sellers only and the valuable statistical data exchanged between the competitors did not find its way also to the bidders.

The real purpose of the open price plan was to establish what Hurley called "the new competition," a sort of friendly cooperation between competitors rather than a competitive war. The effort was made to invest the scheme with a sentimental value and it was spoken of as a sort of brotherhood between former antagonists. Approaching the problem from the economist's standpoint, however, rather than from the sentimentalist's, it was always obvious that the interest of the people lay in stimulating rather than in throttling competitive warfare.

Open price associations have some features which are unobjectionable, but the decisions of the United States Supreme Court and state decisions such as those in Missouri have effectually ended the propaganda that cooperation should take the place of competition.

We have shown that certain natural monopolies are by necessity regulated by public utility commissions and that in all other cases price control is left by the states to the economic laws of supply and demand. There are conditions, however, which the law of supply and demand does not reach. There is a no man's land which neither economic nor statutory laws control.

These instances occur where the trade in a necessary article of commerce is controlled by a monopoly, which monopoly, however, does not fall within the regulation of public utility commissions. The instances are not limited to actual monopolies. It is a virtual monopoly if by reason of its size and influence it is able to dominate the price of its competitors.

Where Anti-Trust Statutes are Inapplicable

There are innumerable examples of price control which do not rest at all on any illegal price agreement. I found, for instance, in St. Louis that the prices of brick were identical with

all brick companies, yet I also found that there was no price agreement and that nothing would have been more useless than a price agreement. I found also that that identical price was not the result of keen competition. It resulted from the fact that one company was as large as all of the other brick companies combined. The large company was sure of its business for the others could not possibly take care of the entire demand and brick could not be imported from other cities on account of heavy freight costs. The large company made its price without consulting or agreeing with anyone else. The independents did not charge a lower price for the simple reason that the large company would immediately lower its price also, thereby meeting them on equal terms, but on a basis which would hurt the independents more than it injured the big company. Knowing that the larger company would meet their price unless they met its price, the independents of course were willing to adopt the high figure. The large company, in turn, knowing that the independents would follow its price lists had no reason arising from competition for holding its prices down. All of the independents frankly admitted that they followed to the letter the price lists of the large company. Competition was dead, but I could find no evidence whatever that the lack of competing prices was due to any excess agreement. The situation was like that of a big dog in a yard with small animals. The small ones did not dare attack the larger dog and the large dog paid no attention to them so long as they let him alone.

I think this is a very true example of a situation which exists generally and which, as I have said, is covered neither by economic nor statutory laws. **If there is no price agreement either direct or indirect, the anti-trust statutes are inapplicable.** We have placed our dependence upon the law of supply and demand, yet here is an instance where the natural law of supply and demand does not function. Some remedy, however, is necessary and it is apparent that the remedy must be looked for in one of two directions. Either there must be some affirmative legislation or else some new economic factor must be brought into play.

Shall Government Regulation Be Extended?

Perhaps there are those who would suggest at once that the remedy is by enlarging the field of public utility commissions and by extending governmental price regulations to cover every case where the natural laws will not in themselves give protection. If that is the answer, then governmental regulation must proceed to bounds hitherto undreamed of. The price-fixing machinery of government must become so extensive and complex that it will threaten to break by its own weight. However inconsistent may be the course of present day legislation, we still believe that the public sentiment of the nation is against the multiplication of governmental bureaus and commissions and against the constantly increasing tendency to place everything under governmental control.

It would be more satisfactory if a way could be found in such instances to stimulate the functioning of economic laws. In the gasoline situation, the Governor of South Dakota, it will be remembered, resorted to economic forces and got quick results by bringing a new factor into competition. He purchased gasoline at wholesale and distributed it at cost when he found that the retail and wholesale prices were too widely apart. By a simple business proposition he accomplished what the statutes could not. The same result could have been secured just as well and far more appropriately by any citizens' organization.

Economic as Well as Legal Aspects

I cannot profess to have found any simple solution for the problems which for years have baffled economists and legislators. The purpose of this article has been chiefly to point out the problems which exist and to call attention to the fact that there is an economic as well as a legal side to every anti-trust case; that the statutory law not only recognizes the economic law, but as far as possible steps aside to give it free play. I must leave the subject with the suggestion that perhaps the remaining problems are to be solved through economic channels rather than by the enactment of further statutory laws. Many things can be done by private initiative and cooperative action which are out of government's reach. The trouble is that we never think of cooperative movement except through the channels of government, and in our passion for legislation want to commit everything to the government's care.

Industry and commerce become more complex as they develop, and public thought is needed more and more in behalf of the public interest. The public thinks of its side only infrequently and spasmodically, whereas business combinations give to their interest constant thought. Business may dismiss all considerations except its own advantage—**the public must find methods of regulation which protect the people and business alike, and which are sound in economics as well as in law.** The problems involved require the best thought of the day, and to those who will accept it, there is here offered an exceptional opportunity for important public service.

Public Roads

The August issue of Public Roads, the Highway Research Journal of the U. S. Department of Agriculture, contains some practical articles on highway subjects. *Traffic Control and Safety* reviews existing methods and devices for promoting highway safety. *Practical Field Tests for Surface Soils* suggests methods for measuring the character of highway subgrades.

Cement Prices

The Texas Portland Cement Company of Dallas, Texas, has put out a snappy little booklet entitled *Cement Prices*, this being an explanation of the factors and conditions which control the company's price policy. The book tells of the publication previously of its "21 Reasons for Our Sales Policy," and its favorable reception by the public.

This question of "Price," the most important and least understood phase of the cement business, the meeting point of buyer and seller, and the elements that enter into it,—the usual weight of the commodity, its manufacture under one standard specification everywhere, and the common custom of quoting the price of cement delivered f. o. b. consumer's town for the latter's convenience, are explained in an interesting way.

McGann Improved Dryers

Patent No. 1,503,054, issued to the McGann Manufacturing Company of York, Pa., covers an improvement in rotary dryers, double shell type, by W. J. Kuntz, assignor to McGann Manufacturing Company.

Lime Sold in 1923

The lime sold in the United States in 1923, as recorded by the Geological Survey, Department of the Interior, amounted to 4,069,830 short tons, valued at $39,934,707, an increase of 12 per cent in quantity and 20 per cent in value over 1922. Lime sold for construction work increased 15.5 per cent, that sold for chemical used 16 per cent, and that sold for liming land decreased 14 per cent. Hydrated lime, which is included in the total given, increased 10 per cent. The accompanying table shows the sales by uses in 1922 and 1923.

Lime sold in the United States in 1922 and 1923, by uses

Use	1922 Short tons	1922 Value	1923 Short tons	1923 Value
Agricultural	272,726	$ 2,005,082	234,138	$ 1,766,574
Building	1,845,208	18,463,825	2,131,533	22,521,628
Chemical:				
Glass works	62,187	463,628	78,942	676,291
Metallurgy	200,799	1,458,553	373,020	3,044,383
Paper mills	310,229	2,683,487	311,309	2,768,909
Refractory lime (dead-burned dolomite)	348,838	2,813,946	357,642	3,599,126
Sugar refineries	16,393	197,878	13,044	164,039
Tanneries	42,978	420,148	53,906	523,994
Other uses	485,441	4,172,420	516,296	4,869,763
Total chemical	1,466,865	$12,210,060	1,704,159	$15,646,505
Sold to dealers (uses unknown)	54,818	576,072	.....	.....
	3,639,617	$33,255,039	4,069,830	$39,934,707
Hydrated lime (included in totals)	1,106,063	9,868,980	1,219,515	12,170,653

The Southern Pacific Railroad Rock Crushing Plants

Three Plants Designed To Supply Railroad Ballast Oil Engines Installed In Two of the Three Plants

SINCE the adoption by the Southern Pacific Company of crushed rock or broken slag as ballast for main line track, the railroad has constructed three rock crushing plants to provide an adequate supply of material.

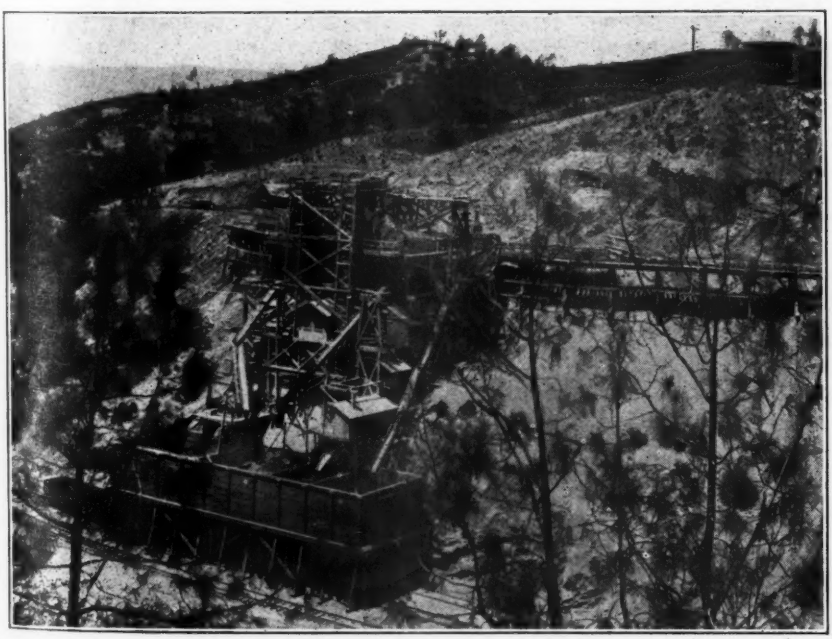
These plants were designed in the office of W. H. Kirkbridge, Engineer Maintenance of Way and Structures under the supervision of W. M. Jaekle, Assistant Engineer. The regular railroad construction forces carried the construction work to completion. The three plants were built and put into operation within eight months. The plants were designed to turn out railroad ballast from ½ to 2½ inches. The material under ½ inch is utilized for many miscellaneous purposes.

The Lucin Rock Crushing Plant

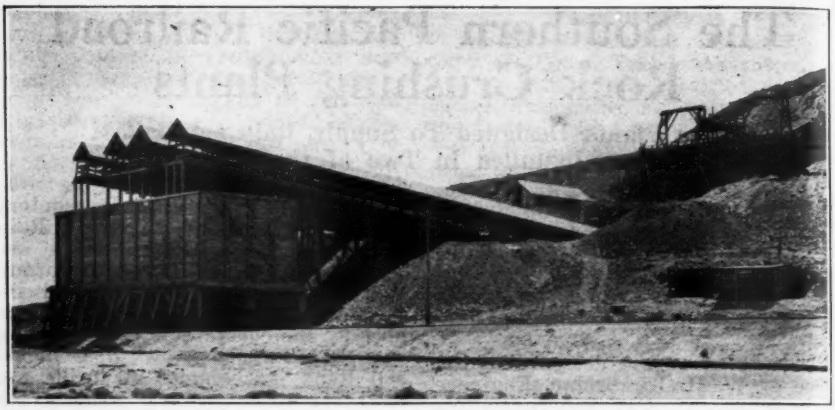
This plant is located about a half mile north of the Lucin Station, Utah, and adjacent to the Promontory Branch of the Southern Pacific Railroad.

The quarry is a quartzite formation badly faulted, broken, and interlaid with limestone. The stone is shot by the coyote hole method using tunnels of "wheelbarrow" size. Ingersoll Rand jackhammer air drills are used for tunneling and drilling for secondary shooting. A complete blacksmith shop with oil furnace, fish oil quenching bath and a steel sharpening machine is located near the quarry face. A four yard steam shovel loads the rock into standard gauge cars for hauling to the crushing plant.

The crushing plant consists of one number 9 and number 10 Gates primary crushers. The stone passes over 4 inch grizzlies before going to the crushers. From the crushers the material passes to 60 inches by 16 feet heavy duty revolving screens with



General View Santa Margarita Quarry.

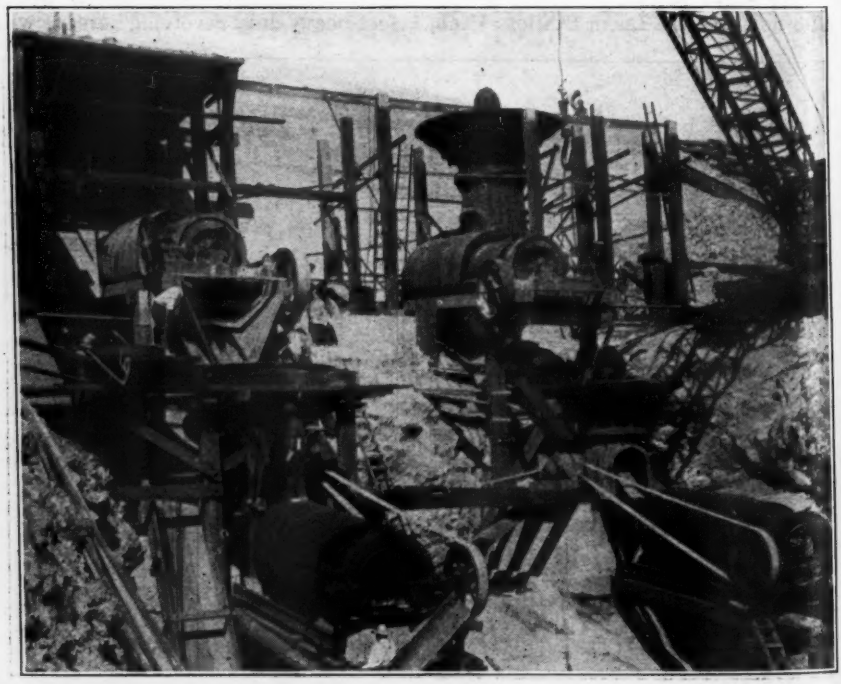


General View of Lucin Plant.

dust jackets 88 inches by 12 feet. The stone is then separated into screenings and from ½ to 2½ inch rock. The oversize goes to two number 7½ Gates crushers discharging into 48 inches by 12 feet revolving screens having 68 inches by 10 feet dust jackets. The rejects pass to a number 6 McCully crusher. From this crusher the stone is conveyed back to the 48 inch screens by a bucket elevator.

From the screens the stone is delivered direct to belt conveyors. The stone is handled by two 30 inch belt conveyors 220 feet long at an incline of about 6 degrees. The screenings are handled by two 14 inch conveyors of the same length and inclination.

A bi-lateral arrangement was



Lucin Plant—Note Crusher Arrangement.

adopted for the crushers. Each side of the plant is complete with primary and secondary crushers with screens and conveyors. The number 6 McCully with its elevator is common to both sides. This layout insures against complete breakdown of the plant and permits better use of quarry equipment due to the minimizing of crusher delays.

All machines are separately driven by electric motors under the control of an operator located at a central point overlooking all machines. The motors are of the wound rotor type with street car type controllers for starting. Remote control push buttons are located close to each machine permitting complete shutdown in case of accident.

The storage bins 100 feet long, 32 feet wide and 25 feet high divided into three compartments provide storage for more than a day's operation. Cars are loaded by gravity on tracks running under the bins. There are two tracks graded so as to utilize gravity in the operation of the cars under the bins. This plant has averaged 2,000 yards of rock a day and on several occasions 3,000 yards have been produced.

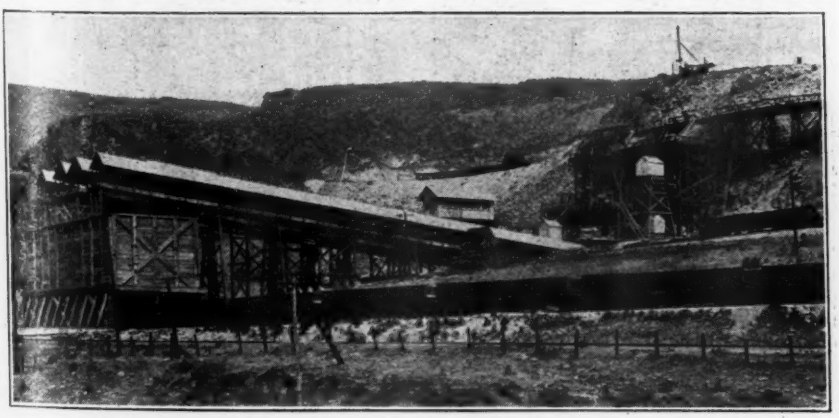
Electric power for driving the machinery is generated in a Diesel electric power house about one-third of a mile from the crushing plant. The main power cables are laid in a heavy wooden flume to guard against any possible damage from flying rock. The prime movers are three six cylinder 300 H.P. Fairbanks Morse surface ignition "Y" type oil engines directly connected to 250 K.V.A. 440 volt, 60 cycle alternators. One 15 H.P. single horizontal cylinder "Y" type oil engine is used to supply lights or power for loads too light to run from the main units. The circulating pumps, fuel pump and starting air compressor are motor driven. These prime movers were adopted after a complete investigation as the most economical and satisfactory source of power for the purpose. Very complete tests were run prior to acceptance and notable economies have resulted from their adoption. A kerosene driven starting compressor is available for emergency. A completely equipped switchboard enables the proper synchronization and operation of the plant units.

The circulating water is cooled by spraying over louvres mounted on the top of a 50,000 gallon wood stave water tank. Scale forming in the engine jackets caused trouble so water treatment was adopted. The water is treated at regular intervals to insure freedom from scale forming compounds.

The Palisade Rock Crushing Plant

This plant is about one-half mile east of Palisade, Nevada, in the canyon of the Humboldt River. The quarry is a formation of successive flows of rhyolite lave. Column loading has been adopted for quarry shooting. The blast holes are drilled by electric blast hole drills using steel drilling cable. Ingersoll Rand jackhammer air drills are also used in the drilling for secondary shooting. A steel sharpening machine, oil furnace, etc., are installed on the quarry floor together with facilities for sharpening bits for the blast hole drills. Four yard shovels handle the rock to three narow gauge trains.

The crushing plant both in arrangement and capacity is the same as the Lucin plant. The power plant is al-



View of Palisade Plant.

so the same except that four 200 H.P. and one 15 H.P. Fairbanks Morse "Y" type oil engines are installed as prime movers.

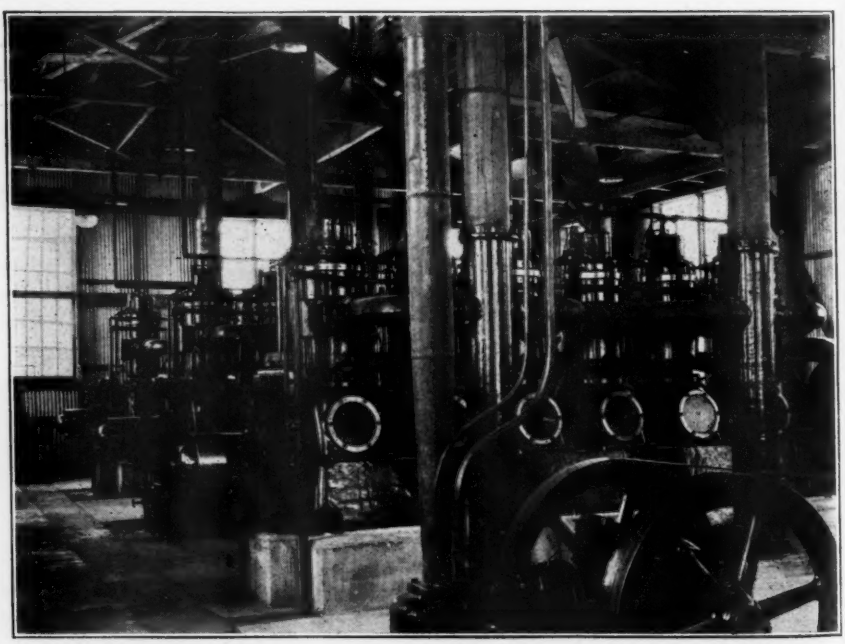
The Santa Margarita Rock Crushing Plant

This plant is about five miles northeast of Santa Margarita and two miles from the railroad. A special spur connects the plant with the main line. The quarry is a massive granite formation partially overlaid with decomposed granite and soil. The working face is now about 110 feet high and eight hundred feet long. It is rapidly developing into an exceptionally good quarry. The rock is extremely hard, fracturing into sharp angular pieces making an excellent ballast. Blast hole drills are used with column loading. Facilities for bit sharpening and tempering are provided above the working face. A blacksmith shop with a sharpening machine is provided on the quarry floor. Steam shovels load standard gauge cars for delivery to the crushers.

The material is delivered to a number 36 Gates gyratory crusher with double spouts discharging into two 36 inch bucket elevators 55 feet centers. Two 60 inch by 16 feet screens with dust jackets remove the ballast rock and screenings. The oversize goes to two number 9 crushers set for fine crushing. These two number 9 crushers permit operation of the plant whenever the large crusher is down. The output of the number 9 crushers is screened by two 60 inch by 16 feet screens and the oversize is finally crushed by a number 4 reduction crusher and two number 6 gyratory crushers. The final screening is done by two 48 inches by 12 feet revolving screens. Only the two large elevators at the number 36 crusher are necessary as the stone is delivered directly to the bins from the crushers. Cars are loaded by gravity the same as at the other two plants. All machinery is motor driven and controlled the same as at the Lucin plant.

The power is purchased at 10,000 volts and stepped down in a 600 K.V.A. open air substation to 440 volts. The substation is located within a short distance of the crusher plant so as to minimize the length of the low tension lines.

The Lucin and Palisade plants are probably the largest and most modern west of the Mississippi River. They are both designed to deliver 100 cars per 10 hour day. Each has a bin capacity of 90 cars.



Interior View of Lucin Power House.

Developing a Quarry

By DANIEL J. HAUER

UNLIKE a sand pit, the developing and opening up of a quarry should be along certain well thought out lines and should follow tried practices. In opening a sand pit or bank, it may be found that the sand varies much in grade, both as to fineness and quality, and other features. Thus some parts of the pit may have sand too fine for some purposes, while in other parts it may be extremely coarse and again at other places, the quality may be so poor that it is not fit to sell. Thus there may be several openings necessary, while at some places where openings are made, they may have to be abandoned.

These things do not to any great extent enter into quarry development. There may be some bad rock, but this is generally on top of the ledge, and rock may vary in chemical composition in lime quarries; but generally speaking, most ledges are uniform and it is possible to work them along the entire face that may be opened up.

The first consideration in developing a quarry will depend upon the kind of quarry it is to be. For a quarry in level country that must be worked as a pit, the first thing to consider is the stripping of the ledge, and the drainage. For a quarry on the side of a hill the consideration of most importance is the location of the plant, as the opening of the ledge must depend upon how the plant is to be approached. In such a quarry the drainage may mean but little, as the water may never accumulate or give any trouble.

For a quarry that may be worked both above and below the elevation of the crusher or stone plant, the plant location is important, but the method of handling the product from the ledge is more vital, otherwise the cost of handling the stone may be excessive. If stone is to be shipped entirely by rail or by water, an important consideration must be how the quarry is located in reference to the transportation facilities.

In some cases of this kind, enough thought and planning are given to the subject, and the installation which is bound to be expensive never gives the desired results, so that it is difficult to make a profit under normal conditions. The writer has in mind a large quarry development on top of a mountain, about fifteen hundred feet in elevation above the railroad track upon which shipment was to be made. The horizontal distance between the quarry and the shipping tracks was about twelve hundred feet.

A plant to crush more than five thousand tons a day was installed, yet the system of conveying the crushed stone from the crusher plant to the loading bins over the railroad tracks had only a capacity of transporting thirty-five hundred tons per day. Thus the greater part of the money invested in the quarry plant was wasted, for there was no need of building a larger capacity crusher plant and the transporting plant. The two should have been coordinated.

It is rather singular that many operators of small or fair sized plants seem to think that the operator of a large plant can make no mistake. It is taken for granted that such an operator knows more than his smaller competitors and that from his superior knowledge he must make decisions that are right. The plant in question cost more than three hundred and fifty thousand dollars, and like many other such plants it was not only poorly designed from a construction standpoint, but also the cost of operation was excessive as compared with the material advantages that the location and elevation of the development presented for a plant that could have been economically operated.

The design of the plant had all of the earmarks of being made by someone that had machinery to sell. Belt conveyors were used on an up-grade, when gravity chutes could have been used, and both machinery and power saved. Furthermore, a slow operating tramway was installed to deliver the crushed stone to the loading bins, where a cheaper installation of belt conveyors and chutes could have been used, and much money saved in the operation. The fact was that if a few thousand dollars had been spent in excavation, thousands of dollars could have been saved in purchasing machinery, and the money saved in operation in a term of years would have been enormous. The fact is the

cost of this new development placed a large company operating a number of large quarries in a rather embarrassing financial position.

There are always many factors to be considered in starting a new development. In most cases the ledge must be stripped, and good judgment must be shown not only in the method of stripping, but in disposing of the spoil. Spoil banks are frequently made so close to the quarry that it may be only a few years before it is found necessary to move the spoil banks. This shows the lack of systematic planning. Nothing should be done in the way of an expenditure until every detail has been planned out, not for a year or two, but for a long term of years.

The site of a plant should be selected with a view of easy shipment of the product and of economical operating of the quarry, and the plant should be so placed as to conform to the future development of the quarry. The way a plant is faced may mean much in the future years. When a quarry is first opened, these things may be insignificant, but in a few years conditions will change, and then without rebuilding the plant may be in an awkward position to be served. At the start one method may be used to transport the blasted rock from the ledge to the crusher, but after a few years it may be advisable to substitute another method or there may be a different type of car used. A plant should be so situated and built that it can be served in a number of ways, and economically, from any part of the quarry.

Another consideration is the elevation of the crushers and this means to consider from every angle the arrangements of elevators, screens, conveyors and other appurtenances. Not only is it necessary to consider these things, but also additions to every part of the plant. A decided difference in arrangements can be made whether steam or electrical power is used.

For steam power all machines must be set up so that belts can be run to the power shafting and yet be located for other uses, so that it will not be necessary to operate several engines. With electricity, a more flexible location of machinery can be made, as each machine will have its own motor so that it can be independent of any shafting. This brings up the subject of the power to use. In many cases there is no room for selection, for only steam power can be made available, and at times, steam may be cheaper than electric power. But there are times when electricity is available so that there can be some choice. In such cases it is possible to select the cheapest power, but it may be well at times to pay a little more for power if enough money can be saved in operation to justify the additional cost of power. Many operators claim there are decided advantages of electricity over steam, not only in the layout of a plant, but in the case of operation. They point out how power is saved by the fact that part of a plant can be run while the rest is dead; while with steam if any part of the plant must be operated, the engine must be going. The conditions covering each operation must lead to the proper decision in the selection of power.

The plant site decided upon, the next question is that of the storage of the products. This is generally decided upon by putting up some fair sized bins with the idea of giving storage to a few hundred tons of material. The products will be sold and delivered almost as fast as the materials are produced; and if this is not done each day, there will be sufficient storage to prevent the plant from being shut down for a few hours each day, or possibly for a day. In some cases this is feasible, but in many locations deliveries are not regular. This is especially the case when shipment is made by either rail or water. There may be a car shortage for several days, yet the entire output of the quarry for the year may be sold. The result is that the plant should be run continuously and deliveries made as equipment is furnished for this purpose. Then considerable storage is absolutely essential.

It may not be advisable to provide such storage at the start, but as the bins are built they should be so arranged that they can be enlarged or readily added to. If storage must be in excess of the capacity of the bins, additional space should be left for storage piles and the method of making such piles should be considered as well as how the stored material is to be rehandled. In too many cases this is not done and when the necessity for such storage comes, instead of being handled in an economical manner it is done in an expensive make-shift way.

This holds true of the location of crushers. Too many operators in starting a quarry seem to think they will never add to their crusher plant.

The reverse is generally the case. What may have been the main crusher at the start may soon become a secondary crusher, so that it may be necessary to install another crusher of the same size as well as a much larger crusher to be the primary machine. The addition should be made without building a new plant. If a well thought out design of plant is made at the beginning, new machinery can be added that will co-ordinate with the old, and the cost of production should be reduced per ton.

With the plant features decided upon, the opening of the ledge is the next consideration. This as already explained must be taken together with the location and layout of the plant. Mention has already been made of the stripping. The next item is that of drainage. In some quarries this may amount to but little, but in others, unless the proper drainage is provided there may be seasons when it will be impossible to carry on the operation.

Arrangements in developing should always be made for all water to drain to sumps, and if it is not possible to carry the water from the sumps by a gravity flow, then pumps must be installed to keep the quarry unwatered. Such pumps may have to be operated night and day, but if possible pumps of such capacity should be used, and large enough sumps should be made so that pumping should have to be done only during the day. This generally means cheaper operation.

In opening up the ledge there are may things to consider. If hand methods of loading are to be followed, the opening should be made in a different way from that followed when a steam shovel or several shovels are to be used. In following hand methods of loading, small cars are likely to be used and then the best arrangement of tracks is that of fan shape, the tracks radiating from the crusher, and thus the ledge is opened up in circular shape. Until the quarry is made of some size, the blasting must be done only a few holes at a time so as to run no chance of blocking all the work in the quarry at one time. After the ledge is developed for some distance back, large blasts can be made; and as the hole in the ledge is made larger, fewer radial tracks are used, but each will have tail and switches against the ledge so as to increase the number of cars that can be loaded at one time without increasing the total amount of track to any great extent. Thus at the start every car being loaded would have its track connecting to the track that leads to the crusher plant, but as the ledge is developed, three cars by means of loading switches would be operated to the crusher track over one track.

If steam shovels are to be used for loading, the quarry should be developed along a long face, and the rock should be blasted out in successive layers or rows and trains of cars should be operated on a track laid parallel to the face of the ledge. A connected track in a long oval where two trains can operate without using switches, one following the other from the ledge to the crusher plant makes an excellent layout. To move the track nearer the ledge as the shovel eats into the rock, it is necessary to cut the track at both ends. After the part near the ledge is shifted, the two ends are connected again. This is not a great objection, as in moving any great amount of track it is necessary to disconnect rails and cut short pieces to make a new connection. One great advantage of such a track layout is the entire elimination of switches with their attending dangers and expense. Trains can approach the crusher plant from either side of the quarry.

There are a large number of track layouts for steam shovel quarries. The most common in use is switch track from a main line track with a dead end. The objection to this is that a steam shovel always loses time while one train is pulling out of the switch and the second train is pulling in. No matter what kind of a track layout is used in a steam shovel quarry, the tracks should always be arranged so that one train can follow another one under the shovel without loss of time, as the output of the quarry is dependent upon the continuous operation of the shovels.

Steam shovel quarries should never be opened up in circular fashion. The shovel and trains cannot be operated as cheaply as when tracks are straight, nor can blasting be done as satisfactorily. With a long face of the quarry developed it becomes possible to make large blasts either ahead or behind the shovel always keeping plenty of blasted rock down for the shovel to pick up. This heavy blasting need not interfere with the other work in the quarry.

At first the length over which the shovel can work without being turned may be short; but each time the shovel goes along the length, the distance can be made greater until the entire face of the ledge is developed. If the crushing plant is properly located, as the breast is developed it will be possible to put two or more shovels at work picking up the blasted rock, so that crushers of large capacities can be operated. Naturally, the layout of tracks must be different when two shovels are employed. It is necessary to have the tracks for each shovel connected with each other so that in case of a breakdown at one shovel all the trains can be used at the other. In this way some extra output may be obtained when a breakdown does occur.

Pit quarries can be worked the same as those already outlined, after they have been developed to some depth, at such elevation as is deemed proper for the quarry flow. The difference in operation will be at the start of the development. Either the pit must be opened upon an incline cutting out a fairly wide path or else the ledge must be attacked from on top and worked down over a fairly good area, as a shaft is sunk. For this kind of work derricks can be used that will pick up the rock and feed it directly to the crushers. Then as the hole is sunk; it is enlarged by blasting down the sides. This is an easier method of opening a pit quarry than driving an incline; but after a pit has been partially developed, an incline for raising the stone from the quarry is better than a derrick, especially if the incline can be at such a grade as to permit the use of trains with dinkeys or motors. Inclines that must be operated by a cable are both inefficient and expensive as it is difficult to keep the crushers operating to their capacity. This is the objection to derricks, even when several derricks are used to feed the crushers.

With a pit quarry and only an incline to develop it, slow progress is made until the elevation of the quarry floor is reached when larger forces can be worked and more stone sent up the incline. The best method to use is a combination of derricks and an incline, for a large area can be taken to a greater depth than by either one of the methods.

Cableways are sometimes used either by themselves or in conjunction with derricks for pit quarries, but although very good work can be done with them, especially in very deep quarries, yet the same objection can be made to them that has been made to derricks. At least one half the time is used in returning empties to the quarry. Thus with a cableway the crusher is bound to lose much time.

Automobile trucks have not been used extensively in quarry work. Their use for delivering stone from the quarry for sales has become quite general, but use so far in the quarry work has been quite limited. There is a large field for their use. Rapid and cheap development can be made with a small steam shovel and trucks. They can be operated on quite steep grades as well as on level ground, saving much track work as well as the continual shifting of tracks. The load they carry is fairly large, and they can be easily shifted from one class of work to another on short notice, as for instance, from rock hauling at the ledge to hauling dirt in stripping. Trucks working in the quarry during the day can be used for stone deliveries at night. There is no doubt that trucks can be used to great advantage in developing quarries in hauling stone from the ledge to the crusher.

In developing a ledge the height should govern the method of working it. When the rock is twenty feet or more deep, the ledge should be drilled with large blast hole drillers, or well drills. There should be tripod drills and jack hammer drills used as auxiliary drills, the jackhammers being in larger number than the tripod drills. Where ledges are fifty or sixty feet in height tunnels or "gopher holes" can be used in the blasting, especially for large heavy blasts. These are small tunnels driven on the floor of the quarry under the ledge with short cross tunnels in which the charges of explosives are placed and detonated. When the depth of rock justifies this method it has proven economical.

When the ledge is not over sixty or seventy feet high, it should be worked in one lift, whether done by hand or steam shovel methods. A ledge of greater height should be worked in two lifts. There are several reasons for this. The drilling of excessively deep holes costs more than those of a reasonable depth, as they are drilled in much less time. The cost per ton of rock blasted for explosives will be less, as more efficient blasting can be done, and the charges for the primary blasting can be controlled

much better. In some cases it is possible to save five or ten cents per ton on the drilling and blasting of rock.

It is also much safer and easier to operate steam shovels in a reasonable depth of rock than where the ledge is of great height. A few years ago the writer was interested in purchasing a steam shovel for a client who operated a quarry, and a second hand shovel was located that was being offered for sale by a quarry company. The shovel had been used but little and was being offered for sale because the ledge of rock was from one hundred and fifty to two hundred feet high and the owners claimed that it was not possible to operate a shovel in their quarry due to the great height of the ledge. They had slips and slides of rock that continually interfered with the work of the shovel and threatened the crew with danger. This trouble could have been overcome very easily by working this ledge in two or three lifts. As the shovel would have loaded cars much cheaper than by hand methods, this quarry company would have found their shovel a profitable investment.

When a ledge is uneven on top and there are large pockets of dirt and rotten rock, the cost of quarrying the rock varies exceedingly. It is possible in such cases to change these conditions somewhat by working the ledge in two lifts. The cost of working the top lift will vary and at some places will be high, but the cost of working the lower lift should be constant, and much lower than the top. Thus it becomes possible after getting the quarry properly developed to work both ledges at one time, making an average cost for the two; or if stone is selling at a high price, to confine the work to the top lift, where the cost of operation may be higher and thus still make a profit. In this way there is developed a large lower lift, that can be worked exclusively if the selling price goes down. This makes it possible to work a quarry to advantage no matter how the price of stone fluctuates.

If there is an upgrade from the quarry floor to the crusher, this is overcome in part by working in two lifts. The stone from the top lift can be hauled on the level or a down grade, while only the stone from the lower lift need be carried up a steep grade. In the case of a pit quarry instead of elevating all of the stone from the quarry floor to the crusher, a part would have to be elevated only about half the distance. These things mean the saving of some money in transporting the stone from the quarry to the crusher no matter how the work is done.

Another advantage of working quarries in lifts is that within a limited area more forces can be employed. As at least one force can be worked on each lift, if there is developed area enough, several forces can be worked on each lift. This may mean a larger output from the crushers, and possibly a lower cost of production.

There are other advantages of working deep ledges in lifts that will be found in trying out this method. A few years ago the writer was called into consultation regarding a quarry that was flooded for several weeks or a month each spring, just at the season when there was the heaviest demand for their products. The matter was of easy solution, for the difficulty was overcome by working the ledge in two lifts, so that when the quarry floor became flooded, quarrying went forward on the upper lift and there was no interruption to business.

When a new plant is to be built or when a new quarry is to be developed, no work should be done until a survey is made of the ground and elevations of the main point are taken. Plans should be made of all the work to be done, not only of buildings to be erected and machinery to be placed, but also of the quarry development.

Highway Research Board Meets

The annual meeting of the Advisory Board will be held at the New National Research Council Building, Washington, D. C., on December 4th and 5th, when the committees will report and a program, to be announced later, will be presented.

Forty State Highway Commissions have named representatives to serve on the Advisory Board on Highway Research of the National Research Council in response to the slogan sounded by Director Charles M. Upham, "The practical application of highway research." This will give the Highway Commissions and the Advisory Board a medium whereby research problems may be thoroughly studied. The problems will be brought to the attention of the various states and others engaged in this work, and the solutions made known to the State Highway Commissions through their representative or contact men.

Portland Cement Output in August, 1924

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on reports of producers of portland cement, but in part on estimates. The estimates for August, 1924, were made necessary by the lack of returns from two plants. Production and shipments for the month once more made a new high record. Stocks were higher than at any corresponding period since 1917.

Production and shipments of finished portland cement, by districts in August, 1923 and 1924

Commercial District	Production, August		Shipments, August	
	1923	1924	1923	1924
Eastern Pa., N. J. and Md.	3,388,000	3,621,000	4,084,000	4,263,000
New York	720,000	803,000	823,000	942,000
Ohio, Western Pa. and W. Va.	1,295,000	1,707,000	1,606,000	1,882,000
Michigan	646,000	1,105,000	788,000	1,175,000
Wis, Ill., Ind. and Ky.	2,008,000	2,133,000	2,080,000	2,529,000
Va., Tenn., Ala. and Ga.	681,000	1,049,000	684,000	1,241,000
Eastern Mo., Ia. and Minn.	1,268,000	1,596,000	1,620,000	1,660,000
Western Mo., Neb., Kan. and Okla.	1,026,000	1,033,000	1,254,000	1,036,000
Texas	385,000	414,000	413,000	433,000
Colo. and Utah	231,000	283,000	275,000	259,000
California	1,009,000	1,063,000	958,000	1,056,000
Ore., Wash. and Mont.	310,000	321,000	386,000	379,000
	12,967,000	15,128,000	14,971,000	16,855,000

Production and shipments of finished portland cement, by months, 1923 and 1924, in barrels.

Month	Production		Shipments	
	1923	1924	1923	1924
January	7,990,000	8,788,000	5,628,000	5,210,000
February	8,210,000	8,588,000	6,090,000	5,933,000
March	9,880,000	10,370,000	10,326,000	8,995,000
First quarter	26,080,000	27,746,000	22,044,000	20,138,000
April	11,359,000	11,726,000	12,954,000	12,771,000
May	12,910,000	13,777,000	14,257,000	14,551,000
June	12,382,000	13,538,000	13,307,000	15,036,000
Second quarter	36,651,000	39,041,000	40,518,000	42,358,000
July	12,620,000	14,029,000	13,712,000	16,614,000
August	12,967,000	15,128,000	14,971,000	16,855,000
September	13,109,000	.....	13,698,000	.....
Third quarter	38,696,000	.....	42,381,000	.....
October	13,350,000	.....	14,285,000	.....
November	12,603,000	.....	10,251,000	.....
December	9,997,000	.....	6,408,000	.....
Fourth quarter	35,950,000	.....	30,944,000	.....
Preliminary total	137,377,000	.....	135,887,000	.....
Amount of under estimate	83,238	.....	25,118	.....
Final total	137,460,238	.....	135,912,118	.....

Study of British "Permitted" Explosives

While British coal mines have made more progress in the application of rock dust to prevent explosions than has been accomplished by American mines, they have not been so uniformly successful in developing safe types of explosives. The Department of the Interior, through the Bureau of Mines, is to conduct tests for the English explosives testing station on British "permitted" explosives, to determine wherein they differ from the "permissible" explosives approved by the Bureau of Mines for use in gaseous and dusty coal mines. This work is being done in pursuance of an arrangement for the exchange of information between the British and American mining bureaus.

Waterproofing Concrete and Cement

SINCE 1907 the subject of waterproofing has been given considerable attention. Experimental work is now being carried on at Columbia University; the Bureau of Standards has taken an active interest in the problem; and the American Society for Testing Materials has issued a statement in regard to it. At first many attempts were made to use mineral substances such as clay, magnesite, and hydrated lime, but recently the tendency has been to get away from mineral substances and to use soaps and oils.

Six general systems of waterproofing have been used with varying degrees of success. These are surface coating, membrane, mastic, integral, self-densified concrete, and grouting. The surface coating system is comparatively cheap and hence has a wide use. It may be applied either to interior or exterior surface of concrete or other masonry. This system refers to the application of (a) an impervious coating of plastic or liquid bituminous materials; (b) various liquid hydro carbons and chemical salt solutions forming water insoluble compounds; (c) a wash or plaster coat of neat cement or cement mortar used principally on brick walls. The coatings may be applied by brush, trowel or machine. The materials ordinarily used in surface coating are: (a) neat cement, cement mortar and proprietary cements which are cements containing void-filling or water-repelling substance; (b) finely powdered metals; (c) mixtures of soap and alum; (d) paraffin either in liquid form or in solution with petroleum oil or naptha; (e) patented bituminous products; (f) liquid hydro carbons.

The membrane system of waterproofiing refers to a built-up, elastic, bituminous membrane composed of from one to six layers of waterproofing felt or fabric cemented together with asphalt or pitch. They are placed in position and covered with a protecting coat. This forms a blanket which more or less completely surrounds the structure. This system may consist of metal linings which are used in underground work such as tunnels, subways and foundations. These membranes do not withstand water pressure unless given protection.

The mastic system of waterproofing is more expensive and more difficult to apply than the membrane method. It consists of (a) the application of sheet mastic (composed of asphalt or coal-tar pitch, sand, grit, and cement or stone dust) in the form of a thin layer which surrounds the structure to be water-proofed; (b) a brick-in-mastic or tile-in-mastic layer composed of a layer or two of brick or tile with the joints filled and the faces covered with a bituminous mastic.

The integral system of waterproofing is inexpensive and easily applied. It is the process of making impermeable mortar of concrete by supplying certain ingredients which act as void fillers, or as lubricants for the aggregate, or chemically upon the cement, densifying the mass. These ingredients include (a) finely ground powders such as clays, silicates, feldspars, and hydrated lime, which are usally mixed with the dry cement at the mill or on the work; (b) liquids and pastes such as calcium stearate (water-soluble soap) sodium, or potassium cleate (water-soluble soap) aluminum, stearate, calcium chloride, and oil compounds. These are usally mixed with the gaging water, though they are sometimes added to the mixed mass to form an integral part of the resulting concrete. This integral system is valuable in treating structures in the course of construction but is not satisfactory with structures that are subject to shock. Vibrations cause fissures which result in leaks. It is especially suited to water tanks, dams, foundations, and other rigid concrete structures.

The self-densified concrete is very effective as a means of waterproofing. It is difficult to obtain but if obtained, it proves to be water tight. To make impermeable concrete by means of self-densification requires a process of proportioning the component materials and mixing them so as to create as dense a finished mass as possible. Concrete may be made dense by the destruction of the inherent porosity of the mortar or concrete, by scientific proportioning of the aggregates, and by expert workmanship. Porous concrete results from too much water and too little mixing.

The process of waterproofing by grouting was invented by Harris in

1891 and is in use at the present time. Wet cement mortar is placed behind and around a finished iron or masonry tunnel or other underground structure. It is injected through the walls or some portion of the body by means of a pneumatic grouting machine. It is forced through cracks, joints, or pipes located in the structure. Rich mixtures are used in order that the grout may be impervious. The system is very effective in the construction of tunnels and in shafts through quick sand or other water-bearing formations.

In the integral system of waterproofing several types of material are used. Hydrated lime is often added for the purpose of increasing the plasticity and lubricating the particles of the aggregate. The United States Bureau of Standards states that the value of hydrated lime as a waterproofing medium is probably due to its void-filling properties, and that the same results could be expected from any other finely ground inert material such as sand or clay. By the addition of 10 to 15 per cent of hydrated lime, the tendency of concrete to check and hair crack is reduced.

In the integral system inert fillers such as clay, sand and natural Portland cement that has been altered by the addition of lime, soda and potash, sand or other materials are specially treated until the mass becomes a water-repellent cement. Fish oil, copal gum, and resinates are also used in this way.

Integral liquids are used to some extent. They are composed of metallic salts, such as calcium chloride and of oil emulsions and soap solutions and solutions of paraffin in benzine or benzol. Waterproofing qualities of these liquids are derived from the formation of gelatinous coatings around the small particles of the constituents of the masonry. This would tend to decrease the strength of the concrete.

Integral pastes are used as waterproofing material. They are soluble mixtures of secret or patented ingredients deriving waterproofing qualities from the precipitation of insoluble materials in the voids of the concrete. By increasing the plasticity of the mass, some pastes act so as to consolidate it. They contain fine clay, lime or colloidal matter. Sometimes pastes are secured by mixing a powder like alum to a cement with a soap solution added to the tempering water. When this is added to the concrete, the two constituents combine to form a stearate of aluminum which is stable, water-insoluble, and void-filling. This alum-soap combination tends to reduce the tensile strength of the concrete.

Different kinds of soaps are being used as waterproofing material. Soaps are the metallic salts of the higher fatty acids or compounds formed by the substitution of the alkalies, sodium and potassium or magnesium and aluminum for the glycerine in common fats. When soaps which contain sodium are exposed to the air they are known as hard soaps. Those which contain potassium, absorb water and tend to liquify. These are soft soaps. Sodium and potassium soaps are water-soluble; magnesium and aluminum soaps are water-insoluble. The soaps most commonly used are dosium, potassium, calcium, aluminum, ammonium, zinc, and magnesium. Soaps are very effective waterproofing substances, but should be tested in order to ascertain whether or not they will tend to reduce the strength of the concrete.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,505,476. Apparatus for handling coal and other material. Jacob M. London, Brookville, Pa.

1,506,077. Excavating device. John W. Page, Chicago, Ill.

1,506,195. Mining-machine. Hess P. Morgan, Lisbon, Ohio.

1,506,421. Surface-excavating machine. Theophil J. Freda, Detroit, Mich.

1,507,661. Wearing-plate for crushers. Charles G. Buchanan, East Orange, N. J.

1,507,697. Dipper. Ernest E. Crane, Minneapolis, Minn., assignor to American Manganese Steel Co., Chicago, Ill.

1,507,970. Ore-crusher. Arthur A. Lazier, Buffalo, N. Y.

1,508,037. Clamshell-bucket. William M. Venable, Pittsburgh, Pa., assignor to Blaw-Knox Co.

1,508,181. Sand-riddle. Judge Green, Chattanooga, Tenn.

Lehigh Portland Cement Company Enlarges Birmingham Mill

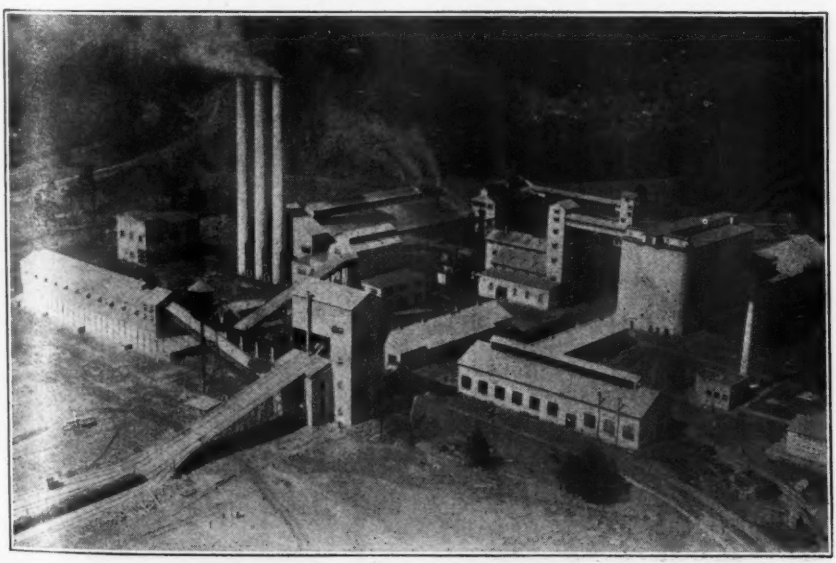
A Fourth Kiln Increases Capacity to 5000 Barrels Daily This Mammoth Plant Now The Most Improved Type of Mill

SUBSTANTIAL evidence of the success attending the national advertising and marketing of a quality product is well illustrated in the large and increasing demand for Lehigh Cement throughout the South. In 1923 the Lehigh Portland Cement Company, finding it imperative to provide for the quick and economical distribution of Lehigh Cement in this section of the country, selected Birmingham, Alabama, as an advantageous point to locate the sixteenth mill in its chain of plants throughout the country. In less than eight months, or to be more exact, in September of 1923, this huge mill was in active operation, a feat which reflects credit on the men who engineered its erection. It was thought that with a capacity of 3,900 barrels a day this mill would be able to amply provide for all normal demands, but early this year the company was confronted with the problem of increasing its output to care for a still further demand for its product.

Immediately steps were taken and additions were effected whereby a fourth kiln increased the daily production to total over 5,000 barrels a day. This additional kiln also made necessary increasing the capacity of the raw mill and an addition to the kiln building, including a stack, cooler and other appurtenances. To the coal house a coal dryer and grinding unit have also been added.

All these additions are being successfully installed by members of the Lehigh organization—a practical demonstration of the ability of the company to solve its manufacturing problems. All additions have been completed and this mammoth plant represents the largest and most improved type of cement mill in this country.

The location of the Birmingham mill provides an inexhaustible supply of raw materials and is also within close proximity to a large supply of coal. The layout of the plant insures speed and economy in the manufacturing processes, and finally, the finished product can be quickly distributed to all railroads out of Birmingham by way of a private rail-



General View Birmingham Mill.

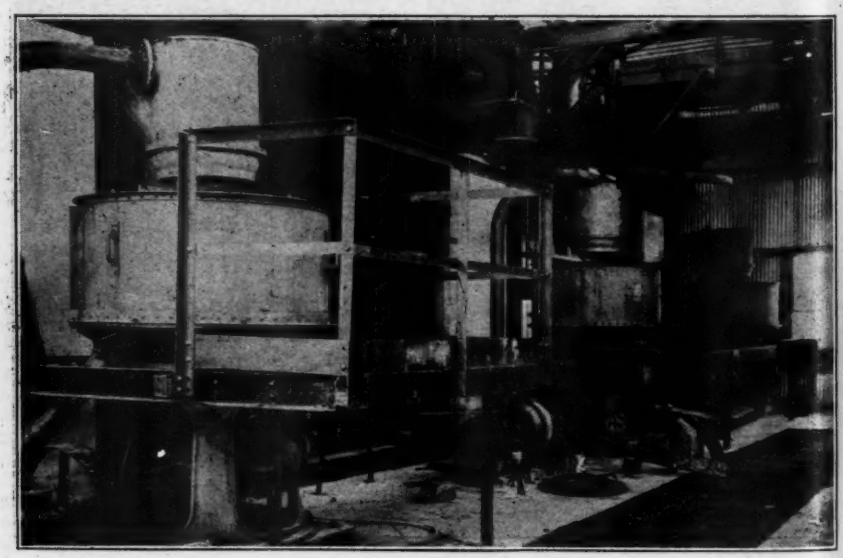
Conveyor Bridge From Stone Storage to Raw Mill.

road owned and operated by the company.

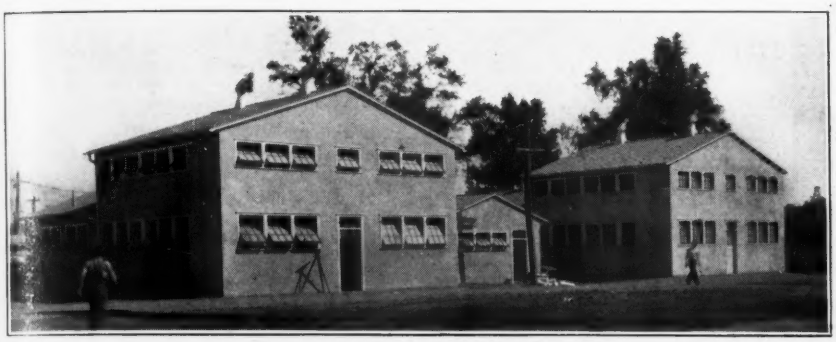
The arrangement of the plant in a rectangular area of the seventeen principal steel and concrete buildings is such as to secure straight line progress of the manufacturing operations. It affords maximum accessibility of all parts to standard gauge railroad tracks (there are no narrow gauge tracks), and provides for future extensions without modification of the initial system.

The organization involves about 200 men, including all classes of labor under the direction of R. H. MacFetridge, Superintendent.

The stock house is composed of ten reinforced concrete silos 32 feet in diameter and 70 feet high, with a



Trix Mills In Raw Mill.



Wash and Change Houses Looking Southeast.

combined storage capacity of 180,000 barrels. The screw conveyor which distributes the cement to the silos, is housed in a concrete tunnel running the full length of the silos, on top, and discharges through chutes into each separate bin. In tunnels under the silos conveyors deliver cement from any silo to the packing department. Box cars can be loaded in from 40 to 60 minutes.

The bag house is located 20 feet from the pack house, and is equipped with a cleaning machine. Sewing machines and operators are provided there to repair rips and small tears in returned bags free of cost, and customers are credited full value for bags not seriously injured.

The dust in the pack house is automatically removed by an exhaust system that provides ducts with inlets at the packing machines, at the conveyors, and at the elevators, through which a very large percentage of the dust in the air is drawn by a powerful exhaust fan, to a collecting chamber. The chamber is filled with canvas baffles that intercept the dust. The baffles are periodically tapped, causing the dust to fall into a receptacle over a screw conveyor that delivers it back to the bins. In the clinker building a similar system of ducts exhausts the dust from the various bins and conveyors and returns it to the main conveyor. In the crusher house a cyclone fan collects

Interior View of Wash House.

the dust from the hammer mills and delivers it to the belt conveyor that transports broken stone to storage.

Throughout the plant every precaution is taken to prevent accidents, to make the equipment fool proof, to safeguard employees and to maintain the most orderly and attractive appearance. Wherever possible moving parts of machinery are enclosed, driving gears and belts are cased, and warning signs are displayed at dangerous points. The hospital building near the office, with reception and operating room and a ward room with two beds, has white tile and enamel finish, and ample heating and ventilating facilities. It is equipped with an operating table, surgical instruments, sterilizing apparatus, medicine chest, and first aid cabinets. Although emergency operations could be performed here, only minor cuts and bruises have so far required treatment.

The employees' comfort and cleanliness are greatly promoted by three change houses; one for the foremen, one for white labor, and one for colored labor. Wash basins, drinking fountains, and tubs for washing garments are provided. The walls and floors have a cement finish and are washed daily.

The office building is located in a grove close to the plant and has rooms of the superintendent and timekeeper, and the chemical and physical laboratories on the first floor; and the rooms of the chief clerk, shipping clerk, and bag department on the second floor. The basement is equipped with miniature grinding machines for laboratory testing purposes. There have been built complete systems of storm water and sanitary sewers with septic tanks. Concrete roads and sidewalks have also been laid.

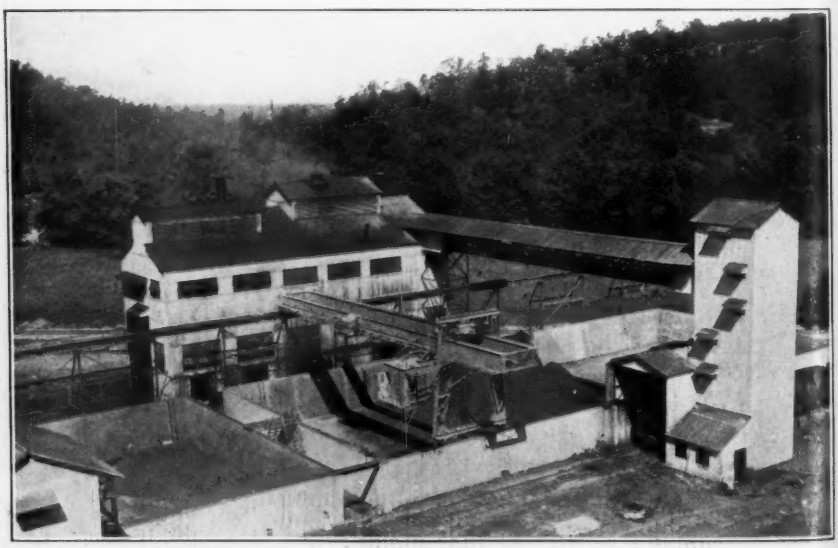
Modern Transportation

A survey of transportation methods in the Coal Industry has been published for free distribution by the General Motors Truck company, Pontiac, Michigan, in a booklet entitled "Modern Transportation for the Coal Industry."

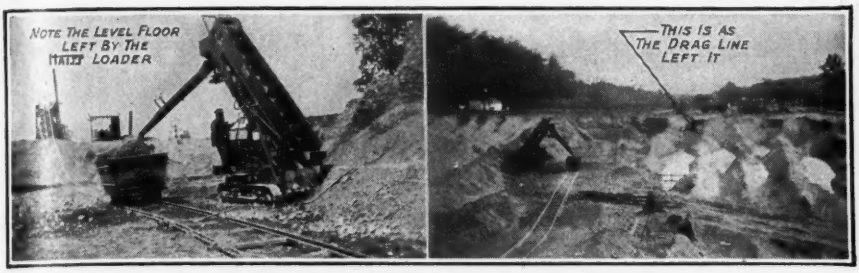
The contents of the new booklet, which is liberally illustrated, represent data gathered by a staff of experts during a year of investigation and apply to the local transportation problems of all divisions of the coal industry, including references and recommendations on equipment and methods.

Salt Produced and Sold in 1923

A statement issued by the Department of the Interior, based upon figures compiled in the Geological Survey, shows that the total quantity of salt sold or used by the producers in the United States in 1923 was 7,130,713 short tons, valued at $27,795,941.



Coal Mill, Coal Elevator, Coal Storage.



A HAISS TRUCK LOADER

Replaces a drag-line scraper

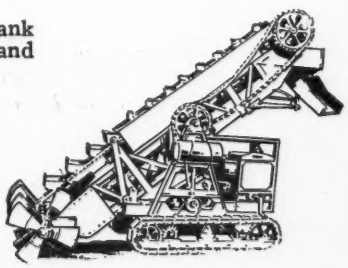
The Triangle Sand Co., Mamaroneck, N. Y. could not get out more than 50-75 yards of sand and gravel a day, with their drag-line scraper. And the scraper outfit left the bottom of the pit in hills and valleys (see illustration above) which was distinctly bad, because the property will in a few years be used for a residential development.

A Haiss Creeper Truck Loader raised the output to 200-300 yards a day, cut a width of 45 feet with one track set up and left the ground in good level condition.

The machine is fitted with a long swivel spout and loads into a 2 yard dump car. The car is loaded in 2 minutes and is hauled up a 300 ft. industrial track to the hopper. It takes 2 minutes for the one car to make a round trip—so the Loader is operated only 50% of the time, or 50% of its possible capacity.

Note that it is digging in a 12-foot bank and that the only labor is one operator and one man breaking down the bank.

Only a big, strong, powerful Haiss Loader has capacity to swing a job of this kind.



Ask for Catalog 523 and learn what a Haiss Truck Loader can do for you.

The George Haiss Manufacturing Company, Inc.

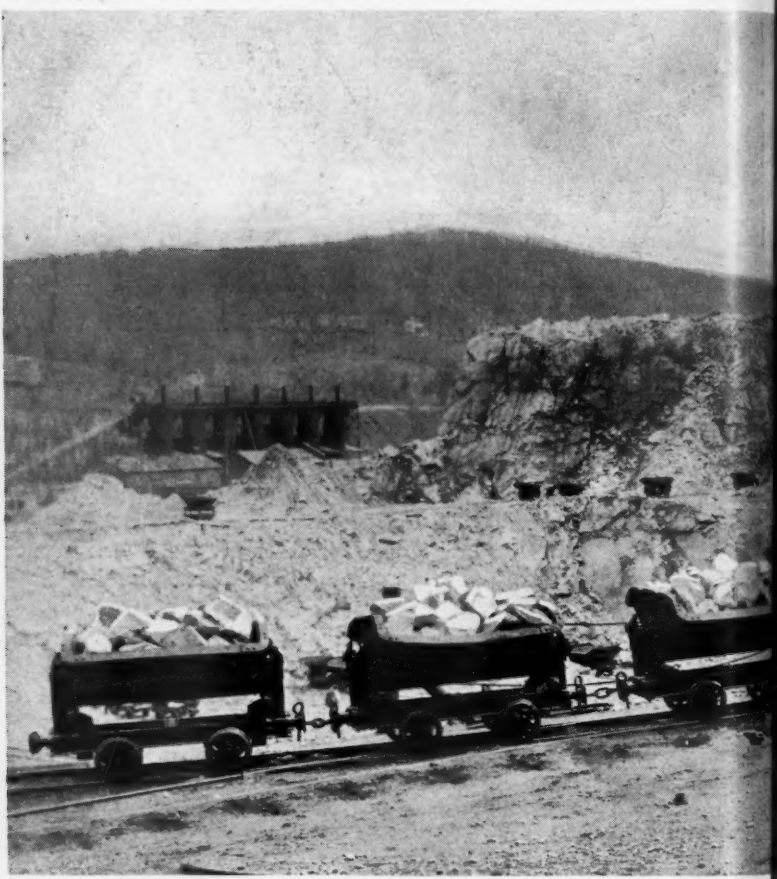
142nd Street and Rider Ave., New York, N. Y.

Cable Address "Coalhoist" New York—"Western Union 5 Letter" Code

HAISS

MATERIALS HANDLING EQUIPMENT

CLAM SHELL BUCKETS



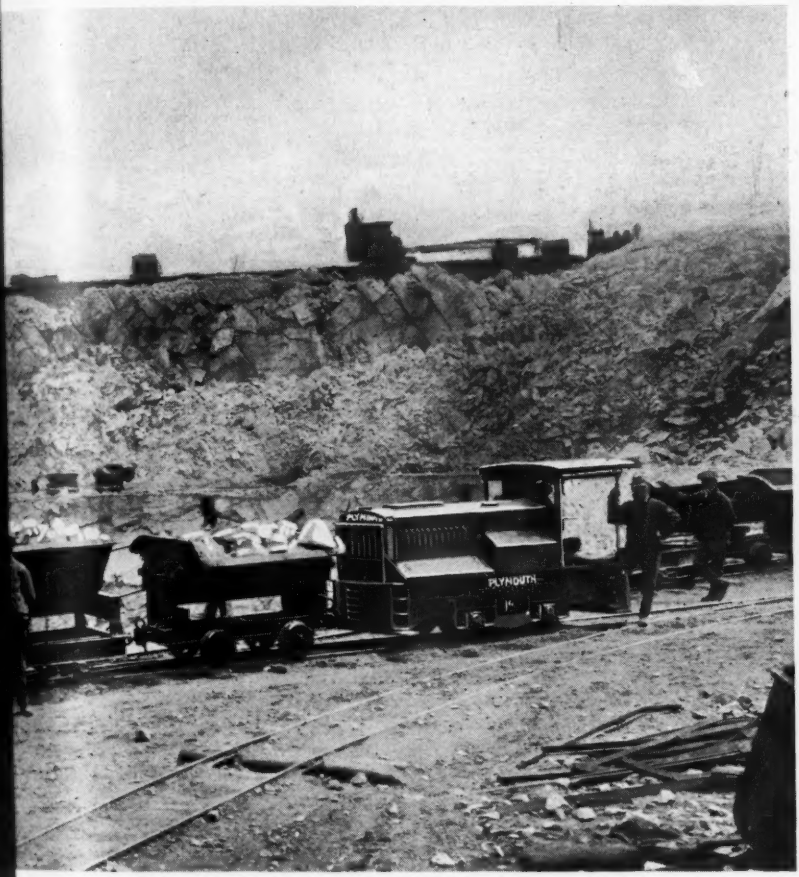
Plymouth Displaces

Every day the Plymouth Gasoline Locomotive is making history in the quarry and sand and gravel pit. It is fast displa the horse, mule and steam dinkie—speeding up production cutting yardage costs.

The above view shows a 4-ton Plymouth at the Mill Lane p of the Knickerbocher Lime Co. of Philadelphia.

Mr. Spellman, Superintendent (the gentleman wearing an o coat in the picture), writes:

Gasoline PLYM



lorses and 2 Drivers

"Our Plymouth Locomotive has displaced four horses and two drivers. soline consumption is about 5 gallons per day; oil, waste and repairs out 10 cents a day. The actual saving, however, is much greater, as re material in the quarry is handled now than was ever possible with rses."

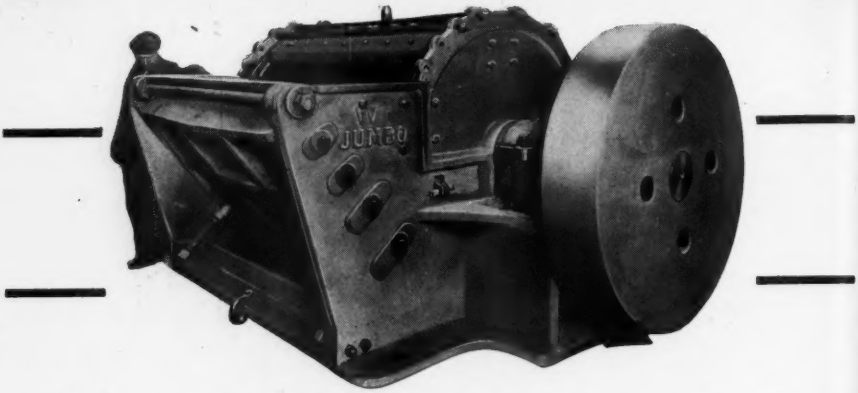
Write for Bulletins "C" and "F".

THE FATE-ROOT-HEATH CO.

Plymouth Locomotive Works

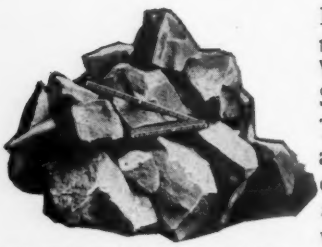
PLYMOUTH, OHIO

UTH Locomotives



"One Williams Crusher Doing Work of 3 Gyratories"

Chico Crushed Stone Co.
Dallas, Texas



14" rock as fed to the Williams Jumbo crusher at the Chico Crushed Stone Co.

100 tons per hour of 14" rock to ¾" in one reduction is the work being done by the No. 4 Williams Jumbo crusher at the Chico Crushed Stone Co. plant.

This one hammer crusher now does the same amount of work as formerly required 3 other crushers with their additional elevators, drives and accessories and is just one more case where investment has been reduced 50% or more and operating costs also considerably lessened by the use of Williams hammer crushers.

If you have rock to crush for any purpose let us show you what we are accomplishing along similar lines in other plants.

¾" product as made by Williams Jumbo crusher.

Williams Patent Crusher & Pulv. Co.
802 St. Louis Ave., St. Louis, Mo.

Chicago 37 West Van Buren St. | **New York** 15 Park Row | **San Francisco** 415 5th Street

Williams

PATENT CRUSHERS GRINDERS·SHREDDERS

Cost Accounting in the Crushed Stone Industry

II

Written expressly for PIT and QUARRY by D. J. HUTCHINSON

THE first of this series of articles appeared in the July number of PIT and QUARRY. In the first article, Mr. Hutchinson discussed cost accounting in its relation to selling prices, the application of uniform accounting methods and material as an element of cost. This article treats of Expense Analysis and Distribution. Readers are invited to submit particular questions relating to cost methods to Mr. Hutchinson, care of PIT and QUARRY.—Editor.

D. J. Hutchinson.

Elements of Cost—Continued

IN the preceding article we noted that the cost of production is ordinarily considered as consisting of three elements—material, labor and expense. In the crushed stone industry the material is the stone in the ground, the cost of which is represented by certain expense items, as depletion, royalties, etc. We noted further that this material cost is only a small part of the total cost of crushed stone production, a fact which in itself has an important bearing on the cost accounting methods applicable to the industry.

Of the two remaining elements of cost, labor and expense, the first, labor, refers to "direct labor" only, or that labor which is applied directly to and becomes a part of the product, as distinguished from "indirect labor" that is employed incidentally in the course of production. This is a distinction that can not readily be established in the crushed stone industry. The fact is that the entire quarry organization exists for the single purpose of producing crushed stone, and it is difficult to say that the labor of any particular group is applied more directly to this end than that of another. For this reason it is more convenient from the standpoint of practical accounting procedure as well as more consistent with actual quarry conditions to overlook labor as a distinct element of cost and consider it instead as an item of expense.

The cost of production in the crushed stone industry then consists of two elements, material cost and conversion costs.

Material—Cost of Stone in the Ground, represented by Depletion, Royalties, etc.

Conversion—Consisting of (a) Labor; (b) other operating expenses.

The material cost is in the nature of a fixed charge, determined by the application of a specific rate to the quantity of stone removed. It is therefore most easily handled as an "addition to cost" after the costs of conversion have been determined. We will therefore return to this element of material at a later point, and turn our attention for the moment to the conversion costs.

Classification of Expense Accounts

Determining the costs of conversion is a matter of so analyzing and distributing the total expenses of production, including labor, that the amount of such expenses applicable to each productive process or operation is made apparent. Such analysis and distribution involves a dual classification of the expense accounts in accordance with the nature of the expenditures and in accordance with the productive operation or process on account of which they were incurred.

The first classification, on the basis of the nature of the expenditure, or

A. B. C. STONE COMPANY

CHART OF OPERATING EXPENSE ACCOUNTS

	DEPARTMENTAL EXPENSES	1000 Stripping	1100 Drilling	1200 Blasting	1300 Quarry Loading and Hauling	1400 Mill	1500 Stock-piling	1600 Loading and Shipping	2000 Shovel	2100 Truck	2200 Power	2300 Floating Gang	2400 General Plant
01	Operating Labor	1001	1101	1201	1301	1401	1501	1601	2001	2101	2201	2301	2401
02	Operating Supplies	1002	1102	1202	1302	1402	1502	1602	2002	2102	2202	2302	2402
03	Repair Labor	1003	1103	1203	1303	1403	1503	1603	2003	2103	2203		2403
04	Repair Supplies	1004	1104	1204	1304	1404	1504	1604	2004	2104	2204		2404
05	Foremen and Supervision.												2405
06	Clerks and Timekeepers...												2406
07	Liability Insurance.....	1007	1107	1207	1307	1407	1507	1607	2007	2107	2207	2307	2407
08	First Aid, Welfare, etc....												2408
09													
10													
11													
12													
13													
14													
15	Miscellaneous Expenses....	1015	1115	1215	1315	1415	1515	1615	2015	2115	2215	2315	2415
	FIXED CHARGES												
20	Depreciation												2420
21	Insurance												2421
22	Taxes												2422
	DISTRIBUTED CHARGES												
30	Shovel	1030			1330		1530	1630					
31	Truck	1031			1331		1531	1631					
32	Power	1032	1132		1332	1432	1532	1632	2032	2132			
33	Floating Gang	1033	1133	1233	1333		1533	1633	2033	2133			2433
34	General Plant	1034	1134	1234	1334	1434	1534	1634	2034	2134	2234		
	DISTRIBUTION CREDITS												
1000	Stripping								1030	1031	1032	1033	1034
1100	Drilling										1132	1133	1134
1200	Blasting											1233	1234
1300	Quarry Loading and Hauling								1330	1331	1332	1333	1334
1400	Mill										1432		1434
1500	Stockpiling				(Contra Accounts)				1530	1531	1532	1533	1534
1600	Loading and Shipping.....								1630	1631	1632	1633	1634
2000	Shovel											2033	2034
2100	Truck											2133	2134
2200	Power												2234
2300	Floating Gang												
2400	General Plant											2433	

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the thing or service purchased is called the natural classification of expense accounts. This classification for the crushed stone industry is given here. We repeat, however, the warning given in the first article that this classification is not intended to be complete in the sense that it provides for every conceivable expenditure that may be incurred in every plant in the industry. It does, however, include the representative expense accounts, and it illustrates the principles of expense classification. Furthermore, as will appear, the methods used are flexible enough to permit any changes in the expense classification necessary to meet local conditions.

Natural Classification of Expense Accounts

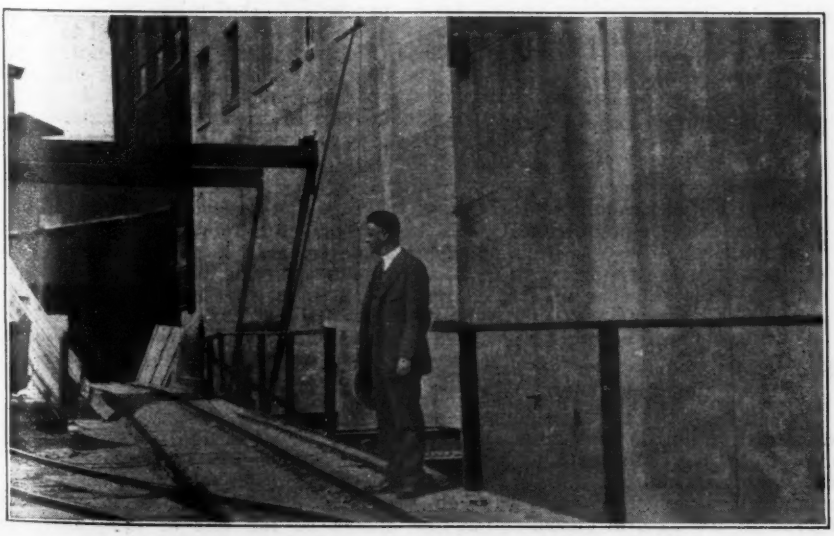
Operating Expenses—
(a) Departmental Expenses
01 Operating Labor
02 Operating Supplies
03 Repair Labor
04 Repair Supplies
05 Foremen and Superintendence
06 Clerks and Timekeepers
07 Liability Insurance
08 First Aid, Welfare, etc.
09
10
11
12
13
14
15 Miscellaneous Operating Expenses
(b) Fixed Charges
20 Depreciation
21 Insurance
22 Taxes
(c) Distributed Charges
30 Shovel
31 Truck
32 Power
33 Floating Gang
34 General Plant
Selling and Administrative Expenses
(a) Departmental Expenses
50 Officers' Salaries
51 Office Salaries
52 Sales Salaries and Commissions
53 Liability Insurance
54 Postage
55 Telephone and Telegraph
56 Printing, Stationery, etc.
57-69
70 Miscellaneous Office Expenses
(b) Fixed Charges
20 Depreciation
21 Insurance
22 Taxes

It will be noted that the natural classification of expense accounts is divided into two main groups.

Operating Expenses.

Selling and Administrative Expenses.

Strictly speaking it is only with the operating expenses that we have to do in determining the cost of production, hence they are separated throughout the accounting procedure from the expenses that have to do with sales and administration rather than with production.



D. J. Hutchinson Looking A Plant Over.

The operating expenses in turn are divided into three groups.

(a) Departmental Expenses
(b) Fixed Charges
(c) Distributed Charges

The basis of this division rests on the different methods of distribution that are applied to each of the above classes of expense, and on the second of the two classifications of expense accounts, which it will be necessary to consider before going further.

As we have noted expenses are first classified on the basis of the nature or object of the expenditure as shown on the natural classification of expense accounts given above. It is also necessary to classify them on the basis of the purpose of the expenditure, or what the expenditure is expected to accomplish, as drilling, blasting, etc.

3. Departmentalization

This classification is based on the successive productive steps or operations that follow one another in the course of production. These successive steps in the course of production are termed for convenience "departments." The second classification of expenses based on the purpose of the expenditure or what it is expected to accomplish is therefore the departmental classification, the purposes of the expenditures as drilling, blasting, etc., each being represented by a separate department.

Departmental Classification of Expense Accounts

Operating Expenses
(a) Direct Departments
1000 Stripping
1100 Drilling
1200 Blasting
1300 Quarry Loading and Hauling
1400 Mill
1500 Stockpiling
1600 Final Loading and Hauling
(b) Indirect Departments
2000 Shovel
2100 Truck
2200 Power
2300 Floating Gang
2400 General Plant

Selling and Administrative Expenses
3000 Sales and General Office

It will be noted that the same general distinction is observed in the departmental classification between the operating and the selling and administrative expenses as was observed in the natural classification of expense accounts.

Moreover, the operating expenses are again subdivided as between direct and indirect departments. The direct departments represent the successive productive steps, or the separate and distinct operations in the production of crushed stone on the basis of which costs are to be accumulated.

In addition to these operations, however, there are other activities on account of which expense is incurred for which no one productive operation is wholly responsible or which can not be conveniently charged to any one particular step in production.

Under the first class of expenses for which no one productive operation is wholly responsible come the expenses in connection with the general operation and maintenance of the plant which are most conveniently accumulated in a fictitious department called "General Plant."

The other indirect departments represent the class of expenses that are really "productive" in their nature but are not wholly chargeable to any one productive operation. Thus the cost of operating shovels that are used intermittently in stripping and in the pit can best be accumulated as a whole by charging them to a shovel department, and distributing the total of this department to the "direct" departments on the basis of the use of the shovel by each. The same principles apply to the cost of operating trucks and producing power, as well as to the expenses of the miscellaneous group of employees often referred to as the "Floating Gang" that is not permanently attached to any one particular operating department, but is thrown in here or there wherever needed.

Referring back to the natural classification of expenses, it will be found that group (b) "Distributed Charges" under "Operating Expenses" corresponds to the "Indirect Departments" and it is to these accounts that the total of the Indirect Department costs is carried when they are distributed to the Direct Departments. The basis of this distribution we will consider later.

The Chart of Expense Accounts

The Chart of Expense Accounts shows how the dual classification of expense accounts is combined to arrive at the departmental costs. The natural classification of expenses is shown at the left of the chart, the departmental classification is shown

across the top. The distribution of the expense items to the departments is indicated by the departmental expense accounts.

It will be noted that the departmental expense account numbers are made up by combining the department number and the expense account number. The department numbers consist of four places, the expense account numbers of two places. Thus with respect to any departmental expense account number, the first two places (reading left to right), that is the thousands and hundreds places, indicate the department, and second two places, tens and units, indicate the expense account number. This method of numbering makes it possible to include or omit any expense item without disturbing the general scheme, giving the expense analysis and distribution that flexibility which as has been noted is necessary to meet local conditions.

It will be noted also by reference to the chart that certain accounts called distribution credits appear under the Indirect Departments. These carry the "contra account" number to which the charges are carried in the direct departments. Obviously the total of the "Distribution Credits" for any indirect department must equal the total of the charges to that department showing that all of the expenses of the Indirect Department have been carried to the Direct Departments as "distributed charges."

Some Remarks on Portland Cement*

WHAT would our present world be without portland cement? If we are wise, we sleep in concrete fireproofed houses. We bathe in water impounded by concrete dams and flowing through concrete pipes. We dress in clothes, the perfection of whose weave is due to vibrationless concrete factories on firm concrete foundations.

We breakfast upon food brought to town over concrete highways and pavements with concrete foundations, from farms having concrete silos, feeding floors, water-troughs, fence posts and buildings. We pass to our concrete office buildings through concrete subways and over concrete platforms and sidewalks.

We plan for the transport of our goods over railroads having concrete bridges, trestles, retaining walls and tunnels, to steamships using concrete docks, walls, breakwaters and lighthouses. We read our evening paper by light generated in machinery set on concrete foundations, the current passing through wires supported upon concrete poles or placed in concrete ducts.

Concrete contributes to our safety, comfort and convenience, in a thousand ways. Because of the ease with which it can be used and its relatively low cost, it has permitted the accomplishment of many things not otherwise commercially practical.

Had masonry been used in the structures which have been built of portland cement concrete during the past century, the additional cost would have approximated a quarter of the present public debt of Great Britain. This assumes that it would have been possible to use other materials than concrete in some of these structures.

Portland cement has saved the world this large investment and has given to it comforts which it would not otherwise have had. Its benefits are multiplying with its increased production and use. It is estimated that the world used in 1923 over 50,000,000 tons or 260,000,000 barrels of portland cement.

In the century since its invention constant progress has been made in improving the quality of portland cement and in perfecting its use. This work has been largely due to individual effort. Joint effort growing out of a better understanding of our common problems should result in even better progress during the next century.

*From address of F. W. Kelly, President, Portland Cement Association at Leeds, England, in presenting to the British Cement Makers' Federation a memorial tablet commemorating the one hundredth anniversary of the patenting of portland cement.

German-American Buyers' Guide

The American Buyers' Guide, a Classified Directory and Handbook for American Importers and Exporters, is available at a price of $2.00 per copy, including postage, from the American Chamber of Commerce in Germany, Equitable Building, Friedrichstr, 59-60, Berlin, W. 8, Germany. This book is a classified directory of over 2,250 names of manufacturing import and export firms, banks, forwarders and agents, for the convenience of American importers and exporters. Every purchaser receives "German Trade Reports and Opportunities."

The Morgue of Business Failures

THE records of the morgue of business failures give "poor management" as the cause of a vast majority of commercial deaths, according to the Domestic Commerce Division of the Department of Commerce in "Budgetary Control in Retail Store Management," the first of a series of pamphlets prepared for the purpose of helping the American retailer overcome some of his more difficult business problems.

Failures have been attributed to lack of sufficient working capital, to a poor location, and are very often falsely laid at the door of economic changes. In summarizing these causes, however, the Domestic Commerce Division says that bad management in some form appears to be the explanation of most of them.

More thorough understanding of individual management problems will save many wobbling retailers, the Division asserts, pointing to the fact that the retail store is conspicuous in the field of business enterprise for the number of casualties.

"Only in the past three or four years has the merchant realized that his business, as well as that of the manufacturer, is a science, and that he, too, can well afford to utilize many of the new methods which are being adopted in business management in the entire field of industry," the Division says in advocating budgetary control.

Operation of a business is much like the running of a ship, the Division points out, in explaining the need for better management. The Captain has a goal—the port to which he is bound; the chart of the course; and the instruments, such as compass and sextent, to keep him on his course. The captain of a business must take the same precautions in guiding his business ship over the rough seas of competition and alternating periods of prosperity and depression. The established quotas and limits are the ports toward which the business pilot is heading; the budget, the map, and the comparison of actual with estimated figures corresponds to the ship's compass and sextant, for by this the direction of movement and the location of the business is determined.

Selling is the "little idol" in many retail organizations, the Division says in connection with the subject of coordination of the activities of a business. Small consideration is given to the cost of these sales and the margin which they should yield. The bringing together of the costs and possibilities of the constituent elements of the selling process enables the community purchasing agent, the retailer, to arrive at an approximately correct relation between sales volume and expense.

The tremendous losses (caused by over-purchasing) which were taken during the last period of depression, can be attributed in part, to the lack of intelligent control of buyers' activities, the Division says in a chapter devoted to Centralizing Executive Control.

Making Forecasts and Recording Results, Division of Budget For Control, Sales Budget, Merchandise Budget, Operating-Expense Budget, Advertising Budget, and the Advantages and Disadvantages of Budgetary Control, are discussed in succeeding chapters of the pamphlet.

The publication was prepared by Laurence A. Hanson, formerly affiliated with the Boston Retail Trade Board and later managing director of the Massachusetts Retail Merchants Association, as a result of original research in the field with which the bulletin deals. The data was gathered directly from prominent retailers all over the country. It represents the co-ordinated opinions of the most progressive retail agencies, and presents an approach to the solution of the problem heretofore unattempted, according to the Domestic Commerce Division. The pamphlet known as Trade Information Bulletin No. 266 may be obtained upon request from the Bureau of Foreign and Domestic Commerce in Washington, or from any of the Commerce Department's offices.

Among the new publications announced for free distribution by the U. S. Department of the Interior, Washington, D. C., are the following: *Bulletin* 225, by G. S. Rice. Stone dusting or rock dusting to prevent coal dust explosions, as practiced in Great Britain and France. *Technical Paper* 353, Quarry accidents in the United States during the calendar year 1922, by W. W. Adams. *Technical Paper* 354, Metal mine accidents in the United States during the calendar year 1922, by W. W. Adams.

Garland Sand and Block Company Operates Year 'Round

Producing 250 Cubic Yards of Sand and 1500 Blocks Daily Cinder Blocks, Concrete Blocks and Concrete Tile Produced

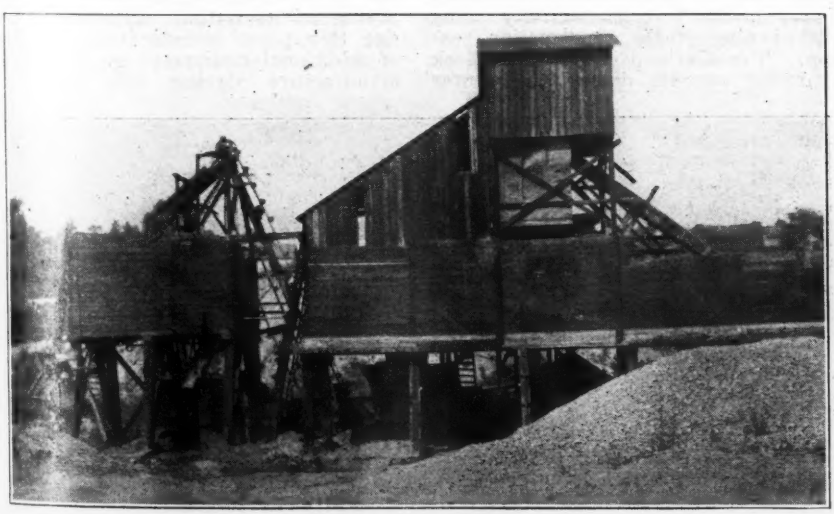
THERE is an enthusiastic demand for better building construction in Youngstown, Ohio, with excellent prospects for concrete products. Youngstown has learned that concrete block and tile are economical construction materials. Youngstown is the home of the second largest building and loan association in the United States. The bank deposits including building and loan associations for 1922 amounted to $69,500,000. Is it any wonder that Youngstown is among the first ten cities of the country in the percentage of home owners? This is an average of $495.00 for every man, woman and child in the city. Nearly half the people own their own homes. The quality of the product as well as the building code of the city has had much to do with the situation. The general run of block made by the Garland Sand and Gravel Company meet and pass the city specifications. It is safe to say that there are no better block made than produced by this company. It is the superior merit of the block made in this plant that causes contractors and builders to specify their block even though there are cheaper block on the market.

The Garland Sand and Block Company was incorporated in 1911. The plant is located in the heart of Youngstown and the company has 11 acres of ground as they also produce sand and gravel.

The sand and gravel deposit is about eight hundred feet from the concrete products plant. The deposit runs about 80 per cent sand and 20 per cent gravel.

A Byers crane loads the material into Koppel dump cars. The cars are drawn over standard gauge track to a hopper. From the hopper the material is elevated by a Jeffrey bucket elevator to the screens. The rejects from the screens are conveyed by a chute to a number 3 Austin crusher. After crushing the oversize is re-elevated to the screens. From the screens the material is elevated by Jeffrey bucket elevators to storage. There is storage for 300 cubic yards of material.

The material is drawn from storage by trucks and delivered on the job or to the concrete products plant



The Sand and Gravel Plant.

Unloading Car At Sand and Gravel Plant.

as required. The Garland Sand and Block Company operates a fleet of four Mack trucks. These trucks also deliver the concrete blocks to the job.

Youngstown absorbs the entire output of several large sand and gravel plants and several concrete products plants. The Garland Sand and Block Company has not attempted to bid for anything but the local demand. This demand however keeps the plant running all the year around.

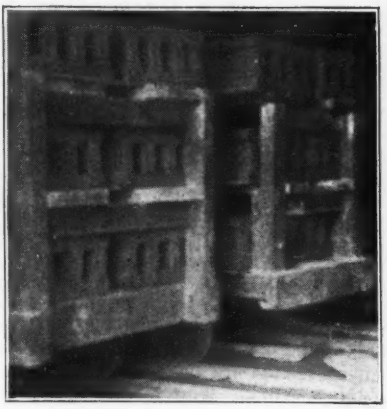
The inactivity of concrete products plants during cold weather is usually followed by feverish activity upon the opening of the construction season. The Garland Sand and Block Company operate during the winter to prepare for the business that is anticipated for the spring. This continuous capacity production not only reduces the cost of each unit but results in a volume of business that brings increased profits. Only a slack market that will not consume the manufactured product affects the additional profit. In the past few years the use of concrete products has increased much faster than new plants have been established. The Garland Sand and Block Company is well situated with respect to market so have not experienced any difficulty in disposing of its output. Several years ago this plant investigated the cost of additional equipment necessary to manufacture during cold weather

The Concrete Products Plant and Office.

conditions and they estimated the increased volume of business with the result that they have continued to operate through the winter periods ever since.

The concrete products plant is modern and up-to-date in every detail. The sand is brought from the sand and gravel plant to the concrete products plant in Mack trucks. The sand is dumped into a hopper directly from the trucks. In the bottom of this hopper is a Kent automatic elevator feeder which feeds the sand into a bucket elevator which lifts and dumps into a bin directly over the mixer. This bin holds about 25 cubic yards and from here the material is fed directly into the sand hopper of the Kent mixer. A separate hopper for the cement is provided with the Kent mixer. The Kent mixer automatically proportions and measures both sand and cement and feeds these materials into the mixing trough where it is thoroughly and uniformly mixed. The mixed concrete is automatically discharged from the mixer and delivered to the hopper of either a Post block machine or an Anchor block machine as required. The Anchor block machine is used for rock faced block and the Post block machine for plain faced block.

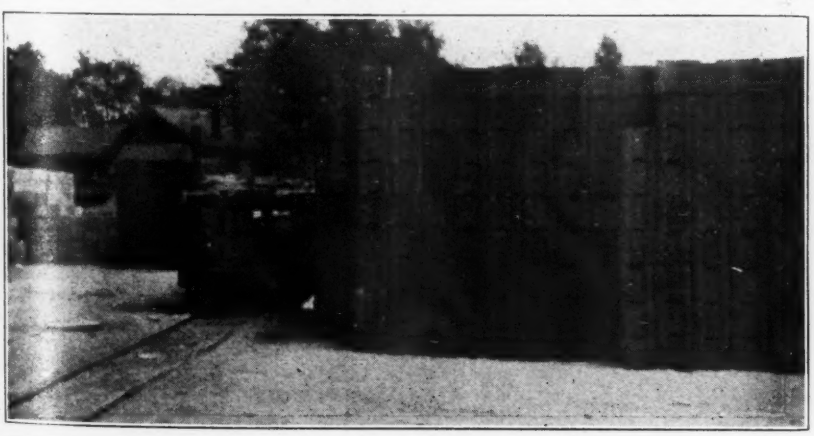
In the bottom of the hopper of the block machines is an automatic measuring device which at every revolution of the machine, measures out just the required amount of concrete for the next block. The material is automatically discharged into the mold box of the machine when the pallet is placed in position. The operator then throws in the clutch and the block is formed and stripped from the mold box at one revolution of the machine. Less than four seconds is all that is required to form and strip the block.



Interior View of Curing Room.

The Post machine will produce 2,000 blocks a day but the Garland Sand and Block Company only require 1,200. They also only require 400 blocks from the Anchor machine although this machine is of greater capacity. The Kent mixer and automatic feeder and the Post block machine were furnished by the Kent Machine Company of Kent, Ohio. The Anchor block machine was furnished by the Anchor Concrete Machinery Company of Columbus, Ohio.

Cinder blocks are also manufactured under the Crozier-Straub patents. The cinders are secured from the blast furnaces and stored in the plant. From storage the cinders are



A View of the Storage Yard.

sent through McKinney crushing rolls. These rolls were furnished by the New Kensington Machine Company of New Kensington, Pennsylvania. The cinders are used in place of the sand in making the cinder block. About 7,000 of these blocks are made every week now by the Garland Sand and Block Company. The blast furnaces of Youngstown produce about 800,000 tons of cinder annually. The block produced from these cinders is an exceptional sturdy block. Since Youngstown is firmly established as one of the world's greatest steel centers, the manufacture of cinder block has proven a profitable business. This block is manufactured under licenses issued by Crozier-Straub, Inc., of New York. The blocks are made of cinders, cement and water.

Concrete tile and special block are also made with metal moulds furnished by Concrete Metal Moulds Company of Carlisle.

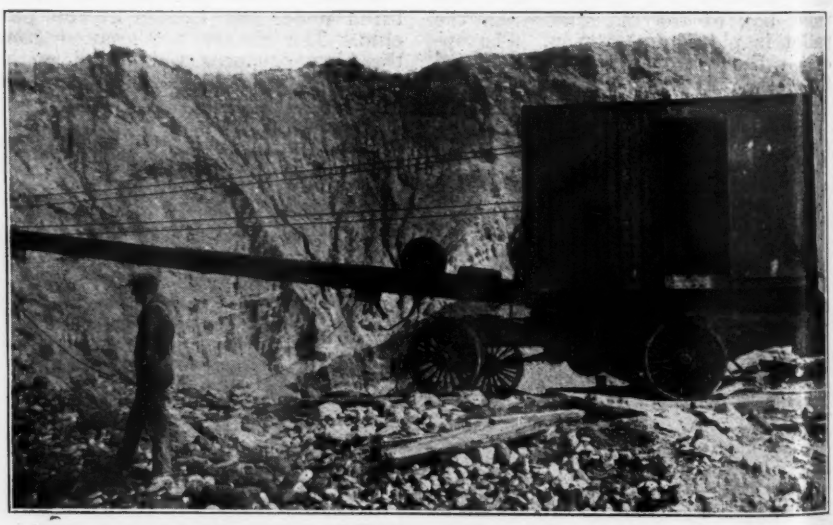
The concrete blocks are loaded from the block machines on Chase rack cars. There are 48 of these rack cars furnished by the Chase Foundry ad Manufacturing Company of Columbus, Ohio. The blocks are then placed on the cars in storage for curing. After curing they are placed in the yard ready for delivery. The curing room is 60x60 feet and the blocks on rack cars are stored 24 hours for curing.

A transfer table runs along in front of the curing room and in back of the block machines. The finished blocks are placed on the rack cars which when filled are wheeled onto the transfer table and then run into any desired aisle in the curing room. This arrangement enables the handling of the green block without danger of breaking. The curing room has excellent ventilating features so steam is not used except in winter. Then only because the block must have moisture and be well hardened before exposure to low temperature. The blocks are left in the curing room during winter periods for 48 hours.

The Garland Sand and Block Company is both a producer and a dealer. Their problems are the same as those experienced in making and selling any commodity. They have succeeded in building a profitable business largely due to sales effort, a factor neglected by many concrete block manufacturers.

The force consists of twenty-two men handling the production of sand and gravel and the maufacture and distribution of the blocks. Mr. E. A. Grubb is president. Mr. J. M. Adams is vice-president, treasurer and manager. Mr. M. Obendorfer is secretary.

The Ginsberg-Penn Company, Construction Equipment, New York City, have recently moved their offices from 50 Church Street, to 18 East 41st Street. They are also extending their warehousing facilities for an increased business in BYERS' products.



A View of the Quarry.

A Visit to Muscle Shoals*

THE WORK now under way at Muscle Shoals, which is on the Tennessee River near the towns of Florence and Sheffield, Alabama, is of particular interest at this time. Likewise, the concrete work at the dam, commonly known as the Wilson Dam, is of special interest to engineers, architects and contractors, because of the high class of workmanship and the results secured under all conditions.

The development of Muscle Shoals and the construction of the Wilson Dam was undertaken by the Government early in 1918 in connection with the manufacture of nitrates for munitions in time of war and fertilizers in peace times.

The project was assigned to the U. S. Engineer Corps and the design for the dam was prepared under the direction of Colonel Hugh L. Cooper, who was in active service when the project was inaugurated. The construction was undertaken by the government, using hired forces. Due to the magnitude of the work a special district was created and at present Lt. Col. George Spalding, U. S. District Engineer, Florence District, has direct charge of all construction for the Government. The Hugh L. Cooper and Company organization now have charge of all design and inspection work in connection with the dam. These two organizations are working in complete harmony and will soon complete the largest concrete project in the world.

The Size of the Project

The total length of the composite structure, or Wilson Dam, is about 4500 feet. The power house section of the dam, abutting the south shore, is 1250 feet long; the dam proper, or spillway section, extends fom the north end of the power house to the lock, and is 3050 feet long. The lock section extends from the dam to the north shore, 200 feet.

The power house unit, 1250 feet long, 160 feet wide and 134 feet high, will house eighteen turbine generators. Four of these units will produce 30,000 horse power each, while the other 14 units will each deliver 35,000 horse power, making available a total of 600,000 horse power when the project is complete. This will be equivalent to approximately 700,000,000 kilowatt hours of primary power per year and 1,490,000,000 kilowatt hours of secondary power per annum.

From the river bed to the crest of the dam or spillway it is 95 feet, while the total height, from foundation to operating bridge, is 140 feet. The base of the dam is 105 feet thick, the design being of the gravity type.

Concrete Required

The lock section will require approximately 76,600 cubic yards of concrete, the spillway section 703,285 cubic yards, and the power house section requires 511,500 cubic yards; a total of 1,291,385 cubic yards. This mass of concrete would build nearly 735 miles of 18 ft. concrete highway, 6 inches thick. Inasmuch as this structure is 218 ft. wide, 415 ft. long and 16 stories high and with a floor area of 1,463,500 sq. ft., an idea can be obtained of the magnitude of the Wilson Dam.

Construction Equipment

To handle this mammoth undertaking requires 27 miles of standard gauge railroad and a force of about 2500 men working in three shifts. Three central mixing plants supply the concrete for the entire job. One plant is on the north shore, and one is on the south shore of the river, while the third and largest mixing plant is located near the center of the work, on Jackson's Island. The north and south shore plants each have two 2-yard mixers, while the Jackson's Island plant uses two 4-yard mixers. These mixers discharge into two or four cubic yard buckets, which are in turn handled by 10 ton cranes. Placing forms, concrete, etc., requires the steady use of 3 McMyler and 7 Terry full circle, 10 ton cranes. Additional mobile equipment consists of twelve lomocotive cranes, 26 standard gauge locomotives, 79 box cars, 65 flat cars, 15 gondolas, and 60 twenty yard dump cars.

Proportioning of Concrete

The concrete is proportioned by volume, the aggregates coming from storage bins into measuring hoppers, and thence to the charging hopper.

*From a paper presented at the National Lime Association Convention at White Sulphur Springs, W Va., May, 1924, by R. P. Brown, Construction Engineer for the National Lime Association.

Proportions are based on the voids in the sand and gravel, the coarse aggregate being tested two or three times during each shift, or from six to nine times a day, to keep the mix constant. Each yard of concrete contains 25 cubic feet of gravel or stone and 5 or 6 sacks of cement, the amount of cement depending upon where the concrete is to be used. This leaves only the sand subject to variation, as the hydrated lime is constant at 25 pounds per cubic yard. The mortar, or cement and sand mixed, is required to be sufficient to fill the gravel voids and provide an excess of 15 per cent. Thus, for example, in a 5 sack batch of concrete, using the average void figures, the sand is computed as follows:

25 cu. ft. of gravel @ 34% voids
i. e. 10 cu. ft of voids
5 cu. ft. of Portland cement
X cu. ft. of sand @ 34% voids

This resolves into an equation wherein the total cement (5 cu. ft.) minus the cement going to fill the sand voids (.34X), plus the sand (X) equals the gravel voids (10) plus 15% (1.5). This reduces to

$$.66\ X = 6.5$$
$$X = 9.9$$

Therefore the cubic yard batch referred to will require 25 cubic feet of gravel, 9.9 cubic feet of sand, 5 sacks of Portland cement and one-half sack (25 lbs.) of hydrated lime.

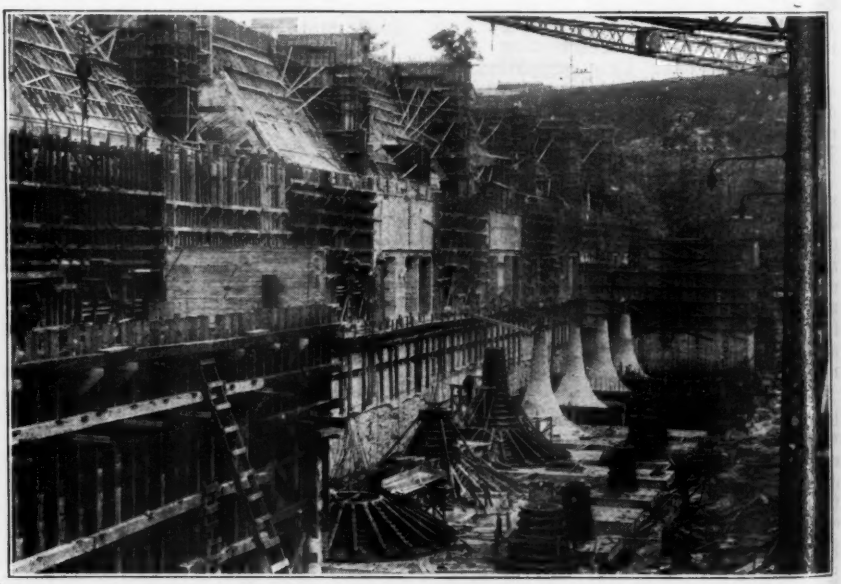
Using the void assumptions just noted it will be seen that a 5 sack batch gives a nominal mix of approximately 1:3:5, while a 6 sack batch makes an approximate nominal mix of 1:1.4:4.2.

Mixing

In the two-yard mixers the concrete is mixed for a minimum of two minutes, and in the four-yard mixers the time is 2½ minutes. If the sand or gravel happens to be running fine, the time of mixing is increased, an inspector being on the job at all times in full charge of the mix. A two-yard batch of concrete requires about 85 gallons of water, the exact amount being subject to the condition of the sand and gravel. Too much water will cause the batch to be wasted when the concrete reaches the point where it should be placed, while too dry a batch means that extra labor will be required to place it without honeycombing.

Determination of Consistency

The control of consistency is strict and is both novel and efficient. All laborers and inspectors connected with placing concrete in the forms are furnished with hip boots and the consistency of the concrete must be such that a man working in it will sink not less than 2 inches, nor more than 10 inches. Inasmuch as the concrete is placed to a depth of from four to six



View of Power House and Draft Tube Sections.

feet in the forms before permitting it to harden, it will be seen that this requirement is rigid indeed.

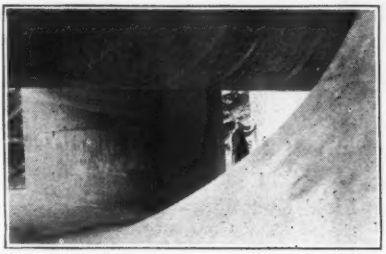
Hydrated Lime Added to the Concrete

At first an addition of two per cent by volume was used, but this was not sufficient, and on February 27, 1923, the addition was raised to five per cent by weight, or twenty-five (25 lbs.) pounds per cubic yard of concrete. With this addition of hydrated lime the concrete has been entirely satisfactory, and an inspection of the work shows entire freedom from segregation, honeycombing, etc.

Careful inspection, good workmanship in making the forms and in spading and placing the concrete, combined with a thoroughly mixed concrete not subject to excessive wetness nor segregation have all combined to give surfaces which cannot be excelled, and which in fact, are seldom equalled.

Form Work

Designing, building and erecting the forms presented many unusual problems due not only to the shape of the units, but also the size and to the pressures which the forms must withstand. The pressures are minimized by limiting the depth of fresh concrete to form 4 to a maximum of 6 feet. Whenever possible the forms are built at a central plant by specially trained workmen and are there assembled so that they can be dismantled and taken to the job in units as required. Some of the curved and warped sections used particularly in connection with the power house construction are excellent examples of form work.

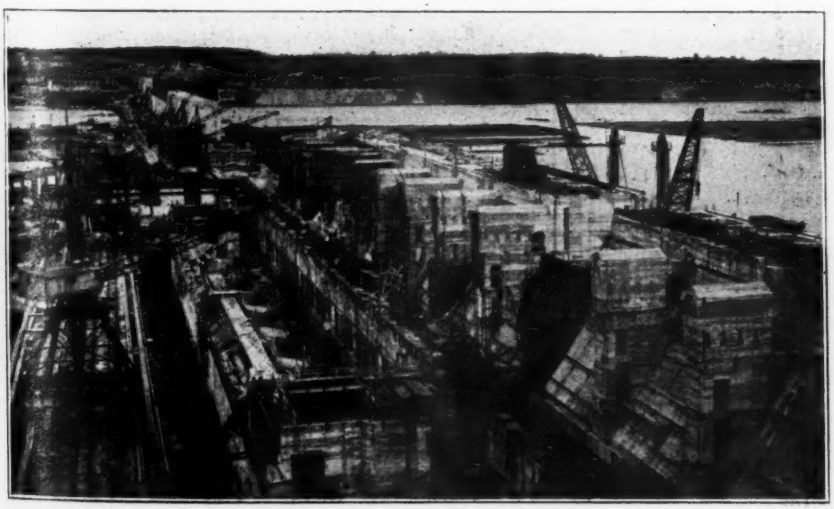


Interior of Draft Tube.

Smooth, dense surfaces are vital. Honeycombing in connection with the concrete work through which the water passes to and away from the turbines might be disastrous, as patching or plastering could not be expected to withstand the violent action in these restricted channels. It is here that smooth, dense surfaces and homogeneous concrete are most essential, and it is under such conditions that the value of adding hydrated lime to the concrete becomes particularly apparent to the engineer.

Tests

A series of briquettes are made from mortar taken from the concrete being placed each day. The mortar is rubbed through a number 8 sieve, eliminating all gravel, and the briquettes prepared, stored and tested in the standard manner.



General View of Dam from South.

All material used is required to meet rigid specifications, and the laboratory tests every carload of cement and lime and carries on a series of check tests on the sand and gravel. Sufficient storage space is available on the job to insure that untested material will not be used.

TEST RESULTS

Field Cylinders—Muscle Shoals Concrete

5 Bag Mix (1:2:5 Nominal Mix)

Hydrated Lime per cent by wt. of cement.	Number Cylinders tested for each avg.	Compressive Strength Pounds per Square Inch 28 days	6 months	6 months
0	18	1518	2061	2482
0.8	36	1740	1904	1943
5.0	36	1726	2200	2369

6 Bag Mix (1:1.4.2 Nominal Mix

0.8	9	1965	2073	2142
5.0	60	2388	2926	3038

MORTAR BRIQUETTES

(Made at Same Time as Field Cylinders)

5 Bag Mix (1:2:5 Nominal Mix)

Hydrated Lime per cent by wt. of cement.	Number Briquettes tested for each avg.	Tensile Strength Pounds per Square Inch 28 days	6 months	6 months
0	15	442	414	441
0.8	39	423	492	501
5.0	55	500	532	511

6 Bag Mix (1:14:42 Nominal Mix)

0.8	9	516	545	568
5.0	100	536	560	531

CEMENT TESTS

Period.	Hydrated Lime Add.	No. of Cars Avgd.	Avg. Tensile St'gth —7 Days.
Feb. 24, 1921 to April 7, 1921.....	0%	25	253
Oct. 1922 to Feb. 15, 1923.	.8%	113	264
March 1, 1923 to Aug. 17, 1923	5.0%	173	308

It is anticipated that the project when completed will represent the highest commercial efficiencies and lowest operating costs known to hydro-electric engineering at this time. The Wilson Dam is a monument to engineering skill, and an example of the possibilities of concrete. Hydrated lime has proved its value in connection with this monumental project, and functions here just as efficiently as it does in concrete used in building industrial or office structures, roads, bridges and culverts.

The writer wishes to acknowledge the many courtesies, and the co-operation extended by Lt.-Col. George R. Spalding, U. S. District Engineer on the job, and the Hugh L. Cooper Company, Consulting Engineers, 101 Park Avenue, New York City, through their resident engineer, Mr. J. W. Hall.

New Incorporations

The Allied Gravel Company, New Paris, Ind., with a capital of 1,000 shares common and no par value, and $20,000 preferred, has been incorporated to operate mines, gravel pits and stone quarries. The directors are L. P. Green, C. G. Knoblauch, H. M. Capron, J. V. Sullivan and James S. Adams.

The Delaware Sand and Gravel Company, Muncie, Ind., has increased its capital from $25,000 to $30,000.

The Sommer Cement Products Co., of Wilmington, Del., has been incorporated for $100,000, to manufacture cement and concrete blocks.

The Raleigh Sand Supply Co., Inc., of Raleigh, N. C., has been incorporated with capital stock of $10,000 by S. J. Busbee, Mrs. S. J. Busbee, and Mrs. C. L. Jenkins, all of Raleigh.

The Madison Sand & Gravel Co., of Youngstown, Ohio; capital $50,000. By C. F. Smith, T. Lamar Jackson, N. A. Emery, David E. Jones and C. Kenneth Clark.

The Holmes Sand Co., Cleveland, Ohio, capital 25,000, 500 shares no par, by M. R. Mendel, Robert L. Carr, E. Brudno Paul R. Brown and M. L. Stanton.

General Clay Products Manufacturing Corp., Wilmington, Del., was incorporated for $1,000,000 to mine, dig and bore clay, sand and ganister rock. by M. L. Rogers, L. A. Irwin and William G. Singer, of Wilmington.

Stearns Sons & Dennin, Inc., of Syracuse, N. Y., were recently incorporated with 100 shares, no par value, to deal in marble, brick and tiling, by George B. Stearns, Edward J. and H. C. Dennin, and F. D. McCurn of Syracuse, N. Y.

The Artisti Kote Co., of Wilmington, Del., was incorporated for $10,000 to deal in magnesite products, clay, stone, plaster and cement.

The Tallahatchie Gravel Co., of Sardis, Miss., was recently incorporated for $15,000 by K. E. Trailer, C. E. Ervine and N. F. West, all of Sardis.

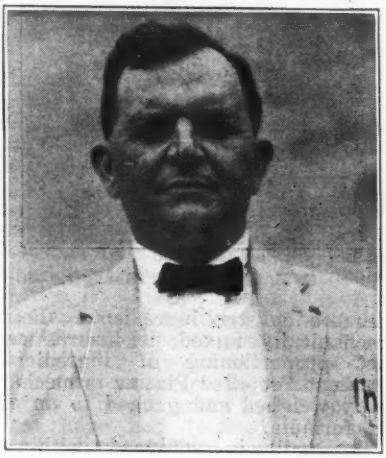
Louisiana's Only Plaster Mill Thoroughly Modern Plant

THE Crescent Wall Plaster Company, Inc., operates the only plaster mill in Louisiana. This mill is located at Poydas and Rocheblave Streets, New Orleans. This location is advantageous. It is right in the heart of New Orleans, making a short haul from the mill to the larger jobs in the main business section. Materials can be received both by rail and water. The company has its own railroad siding and its dock is located on the New Basin Canal right in the rear of the mill.

The construction of the mill was started in March, 1923, and completed late in August of the same year. Actual operation was started on September 1, 1923 and the mill has been in continuous operation ever since.

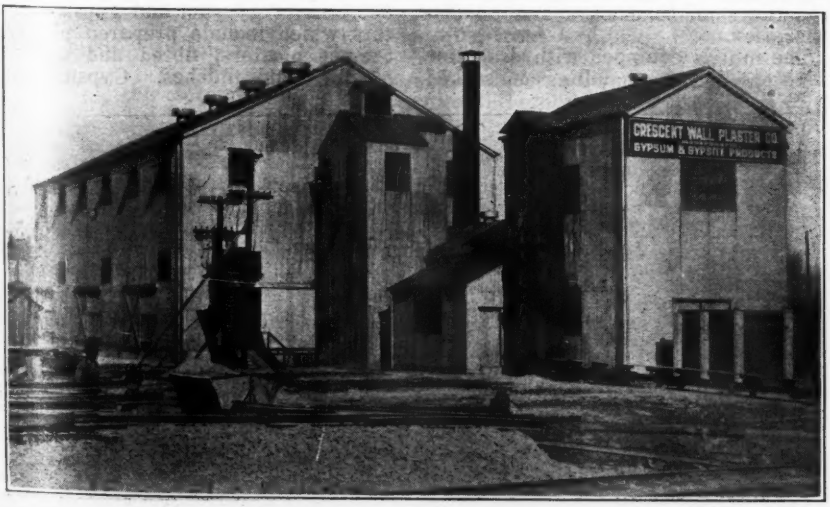
In erecting the mill the Crescent Wall Plaster Company, Inc., gave careful consideration to the future of their business as well as to the present. Additional equipment and machinery can be installed at a minimum expense, while the original mechanical layout will not be destroyed or its efficiency impaired in any way.

The company can at its own convenience, engage in the manufacture of other materials such as exterior stucco, cement, mortar, etc., but at the present time they are confining their efforts to the manufacture of gypsum and gypsite products for wall plastering purposes.



F. S. Beard, Vice-Pres. and Gen. Mgr.

Many factors affect a plastered wall. Oversight, shortage of overage of ingredients, laxity in preparation —all of these affect the finished wall. A mill-mixed product makes it unnecessary for the man on the job to



Louisiana's Only Plaster Mill.

C. E. McCausland, Manager.

D. A. Philips, Auditor.

measure out the ingredients. Being mechanically mixed, it insures correct proportioning of ingredients. Crescent Prepared Plaster is mechanically weighed and gauged to an exact formula.

The mill is equipped with an American Process Rotary Dryer including furnace, dustrooms and all the mechanical apparatus for the drying, screening, and storage of both wet and dry sand. Steel tanks, Broughton Mixers, conveying machinery, both flat belt and metal spiral types, together with automatic feeding devices for the various materials, are being used in the manufacture of their plaster. Petroleum coke is used as fuel in firing the furnace of the sand dryer. This fuel is economical and the sand so dried shows no discoloration.

The mill is equipped with drag line elevators for the handling of sacked materials. Gravity is utilized in handling the heavy bulk materials that enter into the composition of the manufactured products.

Electricity is used exclusively for power and each machine is equipped with an individual motor. Machinery guards, automatic starting devices and safety switches have been installed at all points.

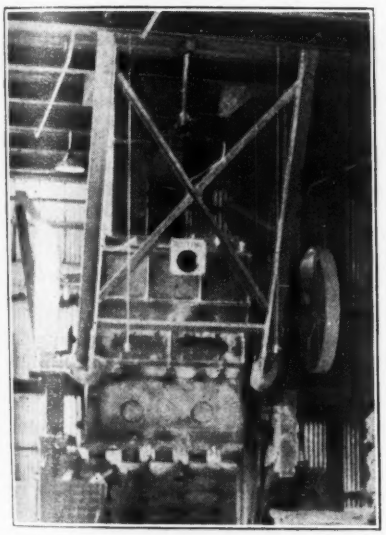
The screens, conveying machinery, elevators and automatic feeding devices were all designed by the company themselves. The design and mechanical layout of the mill is the work of Mr. C. E. McCausland, manager of operations and Mr. F. S. Beard, vice-president and general manager.

The plant has a daily capacity of 300 tons of gypsum and gypsite plasters which include prepared plasters, cement plasters, fibred and unfibred plasters and finishes. Gypsum roof

A View Showing the Rear of the Mill.

tile, gypsum wall board and plaster board are also manufactured. The mill is of steel and concrete construction and is thoroughly modern.

Mr. Frederick S. Beard, vice-president and general manager, has been connected with the gypsum industry for the past twenty-five years. His experience has been with both production and sales. The mill is under the direct supervision of Mr. Claude E. McCausland who has had charge of some of the most outstanding gypsum mills in the country. Mr. Dudley A. Phillips, auditor, is concerned with an important part of the business as manager of the accounting department.



Interior Showing Mixer.

Mr. Beard has found that important interests to develop are the supply dealer organizations. He has taken an active part in their association work and in many instances he has taken membership in these associations. At the present time he is vice-president and a member of the executive committee of the Contractors and Dealers Exchange of New Orleans.

The Landa Rock Products Company announces that it has assumed ownership of the Comal Stone Company with offices and quarry at New Braunfels, Texas; effective July 1, 1924.

Hopeful Under Adverse Conditions

In Spite of Obstacles, Prices Have Not Declined. Operators Active and Look for Good Fall

By Our Cincinnati Correspondent

SAND AND GRAVEL producers in the Southern Ohio district are moving production at a rather unsatisfactory pace. The two outstanding reasons given are: first, greatly reduced finances at the disposal of municipalities in the district; and second, the fact that numerous large building jobs in Cincinnati have been held up for weeks by an involved fight in the City Council over a zoning ordinance which limits the height of buildings, and forbids their construction in certain parts of the city. Contractors are waiting for the outcome of this debate.

In spite of the fact that the district is not on a parity with other markets of the country in production, prices have not declined. Washed gravel sells at $1.50 a ton f.o.b. cars, while sand continues at the old level of $1.20 f.o.b. cars. The cement level is $2.86 a barrel, mason lime continues at $14.30 a barrel, finished lime $16.80 a ton.

River operations on the Ohio have been handicapped by low water. The Ohio Gravel Ballast Company reports that August was a successful month. The company is operating three of its five plants, and has installed a new American Locomotive Switching engine and a Baldwin Hauling engine. A good demand emanating from Kentucky Road business is reported.

The Moores-Coney Company, Cincinnati Supply House, reports a fair outlook for fall. Railroad movement was never better. The Red-Bank Gravel Company is hopeful under present conditions, and is operating its two plants on an eight-hour schedule.

Crushed Stone Convention

The National Crushed Stone Association will hold its next annual convention in Cincinnati, Ohio, January 12, 13, 14 and 15, 1925, at the Hotel Gibson.

The plans indicate that this convention will be one of the biggest and best ever held. Producers should make plans to attend and advise A. P. Sandler, 405 Hartman Building, Columbus, Ohio, as soon as possible.

Foreign Cement Being Dumped on Atlantic Seaboard

Brief Filed With Treasury Department by Domestic Producers. These Are Banner Times in Cement Field

By Our Special Correspondent

THERE are no idle kilns in the Lehigh Valley cement district of Pennsylvania. All plants are running at maximum capacity. These are banner times in cement manufacture in this section and in decided contrast to a number of other prominent basic industries hereabouts, notably iron and steel plants and textile mills, which have been running on curtailed schedules for many weeks.

The turn of fall has brought increased orders for cement from different sources, with road construction still holding up well. Large contracting interests have been making inquiries for forthcoming projects that will absorb a heavy tonnage.

Warehouses at the majority of the larger mills are still comparatively empty. The plants wherever possible, however, purpose to develop a reserve during the next few months to carry over the annual period of machinery repairs, as well as to assure prompt shipments at all times during the winter and spring months. The present low interest rates on money are also attractive in this respect.

Shipments during August have closely duplicated those of July, which was close to a record-breaker.

There are plenty of men available for all branches of service; the fuel supply is good, and the majority of the plants are well stocked ahead with coal; the car supply continues up to demand, and the available rolling stock during recent weeks has had a tendency to reduce the motor truck distribution to nearby cities, such as Philadelphia, Trenton, etc., owing to lower cost. Motor truck fleets, however, are still being used to excellent account, and unquestionably will continue as an important factor in deliveries.

A disturbing factor in the situation is the increase in importations of foreign cement at various points along the Atlantic seaboard. The situation already has been brought to the attention of the United States Treasury Department by domestic cement interests, and a brief has now been filed with this office requesting the application of the provisions of the anti-dumping act to incoming cement from other countries. It is set forth that the material is being shipped into the United States at figures below those at which it is sold for local consumption in Belgium, Denmark, Norway and Sweden; that domestic cement manufacture and distribution are being and are likely to be seriously injured by reason of the foreign importations, with loss of markets, forced reduction in prices to certain points where even now profits have vanished, and enforced curtailment in mill operations.

Cement mills in the vicinity of Egypt have been particularly heavy producers during the past few weeks.

The Bath Portland Cement Co., Philadelphia, Pa., with present mill at Bath, Pa., will proceed at once with plans for a new mill on a large tract of property acquired some time ago at Sandt's Eddy, near Easton, Pa.

The Lehigh Portland Cement Co., Allentown, is continuing full operations at its different mills in the Lehigh Valley section, with the Ormrod and West Coplay plants under peak conditions.

The Virginia Portland Cement Co., National Bank of Commerce Building, Norfolk, Va., a subsidiary of the International Cement Corporation, 342 Madison Avenue, New York, is making ready to proceed with enlargements and improvements at its local mill. The entire plant will be remodeled and a re-equipped and a number of additional buildings erected.

The White Portland Cement Co., Los Angeles, Cal., lately charted under state laws with a capital of $3,000,000, is consummating the purchase of a tract of property at East Los Angeles, totaling about 15 acres, as a site for a new mill.

Thew Type O Shovel

The latest Thew bulletin, just issued, *The Type O Steam Shovel*, is prepared more as a help in choosing between various steam shovels and to bring out the vital points to look for in buying.

The book deals with details and principles of construction, taking one feature of Thew construction after another, the turntable, the engine, the boom derrick, shovel boom, hinges, stick and dipper, and contains also tables of Working Range and Trenching Work. Write The Thew Shovel Company, Lorain, Ohio, for copy.

The Effect of Lime on the Low Temperature Distillation of Coal*

THE great increase in the use of internal combustion engines in the past ten years has created an excessive demand for gasoline. This naturally has led to greater activity in the oil fields, but new wells have not been sunk rapidly enough to supply the demand. Thus it has become necessary either to obtain a substitute for gasoline or to find a new source of supply.

Extensive experimental work has been conducted with bensol, and this is used to a considerable extent in Europe. The Diesel and similar oil burning engines have been able to utilize fuel oil, but these engines are not suited for automotive service. The limit of the gasoline fraction has been raised from 150 to 200 degrees centigrade, thus giving a much poorer grade of product, and the problem seems to demand a greater quantity of good quality gasoline as a solution.

When coal is distilled at low temperature, the resulting products contain a small amount of "motor spirit," but not in sufficient quantity to be of value. If, however, this fraction could be materially increased, it would offer a possible source of gasoline other than petroleum. About twenty years ago Mr. W. A. Miller, who was then Superintendent of the East End Gas Works of Cincinnati, distilled a mixture of coal and lime (Ca O). No record of the results obtained was made, but the yield of ammonia was materially increased. Since the residue was worthless as coke, the process was dropped. No note was made of the effect of the lime upon the tar or gases evolved.

When coal is distilled at low temperature, i. e., up to 650 degrees centigrade, the products obtained consist of paraffin, hydro carbons, olefine hydro carbons, the oxides of carbon, water hydrogen, sulphide, oxygen, nitrogen, and aromatic hydro carbons. Between the temperatures of 400 and 600 degrees centigrade the constituents of coal undergo a polymerization that produces cyclic compounds of the benzol and phenol types. As the temperature is raised, these compounds split up and undergo further polymerization with the evolution of hydrogen and the ultimate product is pitch. Thus it is evident that raising the temperature beyond 600 to 650 degrees centigrade simply increases the complexity of the hydro carbons and the yield of hydrogen.

The introduction of lime (Ca O) might influence these changes so as to prevent the initial polymerization or change its nature so that the resulting products will be of the paraffin series.

Calcium oxide may act as a catalytic agent or furnish a source of calcium-ion which may produce this result. Very little is known about the true chemical constitution of coal, and most of the present information is purely theoretical; therefore, it is impossible to predict what action lime will have upon the coal distillation.

An investigation has been made to determine the effect of calcium oxide upon the low temperature distillation products of coal, particularly those of the paraffin series. The conclusions reached were as follows. Very little ammonia was evolved from the distillation of plain coal, but as the percentage of lime increased, the yield of ammonia was also materially increased. In these latter cases the ammonia continued to flow from the delivery tube after the gas had ceased and was especially strong with the 20 per cent mixture.

The yield of tar seemed to remain about constant when calculated to the basis of one kilogram of coal. Therefore, it is reasonable to assume that the addition of lime does not affect the quantity of tar obtainable to any marked degree, but the addition of lime raises the boiling points of all the constituents. This would indicate that the lime increased the polymerization of these hydro-carbons instead of preventing it. The yield of 3.8 cc. of paraffins from plain coal seems to be high as the subsequent yields from the 10, 20 and 30 per cent mixtures show a marked increase, calculated on a basis of one kilogram of coal. The same polymerization in the paraffins is indicated as in the case of the tar, a higher boiling fraction being produced upon each successive increase in lime content.

From the standpoint of a possible

*From a thesis presented by James Tevis Crutchfield at University of Cincinnati.

source of gasoline the results obtained were not satisfactory although the yield of paraffins was increased. It was noted that the evolution of gas and tar was increasingly rapid as the lime content was increased and the temperature advanced to 600 degrees centigrade, and then receded to 450 degrees centigrade as the distillation progressed in each case where lime was added.

The increase in olefines as shown by the gas analyses corroborates the increase of ammonia as this latter is the probable cause of this peculiar behavior. The hydrogen and methane contents seem to vary according to no fixed rule.

Future investigation with a view to determining the effect of lime upon the change in the quantity of gas and ammonia would be interesting.

No Let-Down in Demand

Prices for Sand, Gravel and Stone Are Maintaining at Established Levels. Demand for All Materials Steady

By Our Pittsburgh Correspondent

SAND AND GRAVEL producers in the Pittsburgh, Pa., district are maintaining active operations at their different locations on the Allegheny and Monongahela Rivers, and a maximum production schedule is prevailing. Barges in large number are busy on the rivers.

Orders are keeping up well with current output and there is every indication that the present rate of business will maintain for some weeks to come. Equipment is also being enlisted in service for river front repairs and a number of contracts have been let for such work. The Federal Government, likewise, is making a number of needed lock and other river improvements which will tend to assist transportation.

The local equipment market is another active branch of the industry, and there is a good current call for steamer and barge apparatus not only from Pittsburgh interests but from sand and gravel producers in West Virginia and Ohio. The Marine Mfg. & Supply Co., has been furnishing equipment to the Ohio River Sand & Gravel Co., at Marietta, among other companies, and is also running at good capacity at its boat repair works.

Market quotations hold well to established levels; the tone is firm, and the sizable orders now being placed for current and future deliveries at existing prices indicate little if any change for some time to come: The labor situation is equally satisfactory.

Best washed gravel continues at $1.10 a ton in cargo lots, wholesale, at company docks. The price at the diggers is around 70 cents. Local building supply dealers are quoting at $2.00 and upwards for delivered stocks.

Clean, sharp river sand is finding good sales at the prevailing level of $1.25 a ton at company docks, wholesale, cargo quantities. Up to $1.50 a ton is asked for deliveries in different zones. At the diggers, a rate of $1.00 a ton is current.

Portland cement is priced at $2.19 and $2.20 a barrel in carload lots, f.o.b. city, less bags, with cash discount to be deducted. This is a decline of about 5 cents in the barrel rate, wholesale, of a year ago. There is a firm demand for the material, although some of the companies are complaining on account of better call. The Bessemer Limestone & Cement Co., Youngstown, Ohio, is among those recently curtailing shipments from the mills.

Crushed stone at Pittsburgh is holding to a $2.85 per cubic yard level, wholesale, carload lots, both 1½ and ¾-inch sizes. Dealers are adding $1.00 to $1.25 for retail sales, delivered on the job.

The Hudson Sand & Gravel Co., will make an extension to its anchorage at the Allegheny River end of its drag line cableway in the vicinity of Kittanning. The company will also make other improvements at this point, including the installation of a mast and beam to facilitate operations.

The Rodgers Sand Co., is giving the usual fall attention to necessary repairs in its fleet and has laid up its steamer, "Sweetcake," for overhauling and general repairs. The company is keeping a large fleet in action on the river and working under good capacity at its diggers.

The Glassmere Sand & Supply Co., Glassmere, Pa., has tentative plans under advisement for dredging a new harbor on the right bank of the Allegheny River, near the plant of the Penn Iron & Steel Co., to be used in connection with added production and distribution facilities.

Rock Dust in Coal Mines

DISCOVERY of the fact that pulverized rock dust can be used in coal mines to prevent the terrific explosions that have cost the lives of thousands of miners has led to the creation of a considerable market for this material, hitherto largely a waste product. The powdered stone dust is strewn lavishly along the sides, floor and roof of mine rooms and passageways and, when projected into the air by the force of a minor gas explosion, serves as a screen or curtain to hem in the exploding coal dust, thus preventing the occurrence of a general mine explosion.

Dusts of pure shale, limestone, dolomite and gypsum are available for this highly useful purpose. These materials are usually free from silica, which in finely pulverized form is highly injurious when breathed into the lungs of miners.

Studies made by the Federal Bureau of Mines in its own experimental coal mine near Pittsburgh, Pa., have demonstrated beyond doubt that the myriads of particles of fine coal dust suspended in mine atmosphere or lying along the sides of floors of rooms and passageways constitute an ever-present explosion menace. In the past, coal-mine operators have fought this menace by wetting down with water all accumulations of coal dust. It is exceedingly difficult, however, to keep the dust accumulations thoroughly moist, and many disastrous explosions have occurred in mines which were sprinkled with regularity.

In England, where the stone dusting of gaseous coal mines is required by law, there is no record of a general mine explosion in any mine where the practice has been adopted. Experiments have shown conclusively that an advance air wave of tremendous force precedes by the fraction of a second the onrush of a coal-dust explosion. If rock dust be properly distributed throughout the mine, the force of this advance air wave is absolutely certain to project the rock dust into the atmosphere, checking and cooling the coal-dust explosion before it can gain fatal headway.

The Government experts maintain that the rock-dust method is not only safer and surer than the wetting process, but is really cheaper. Fresh supplies of stone dust need be distributed only occasionally, whereas wetting must be done every day.

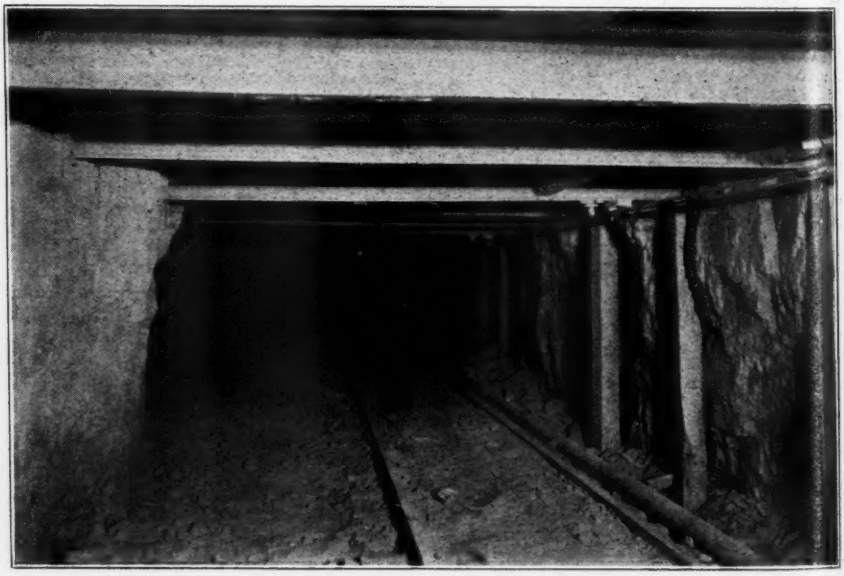
A "rock dust train" composed of

Applying Stone Dust with Cement Gun.

Coal Mine Passageway Before Rock Dusting.

two cars is generally used for distributing the dust throughout the mine. A photograph of the first such train installed in a commercial coal mine in Pennsylvania is shown. An operator seated in the first car handles the compressed air mechanism which projects the dust cloud through a long, hose-like tube. The second car is the reservoir which contains the stone dust. In some mines, the rock dust is "shot" into place with a cement gun.

In addition to distributing the stone dust along the floors and sides of rooms and passageways, "rock dust barriers" are sometimes placed in the passages. In these barriers the stone



Coal Mine Passageway After Rock Dusting.

dust is heaped upon a series of shelves suspended from the mine roof and so balanced that the advance air wave of an explosion will release the shelf, causing the rock dust to drop and form a protective screen or curtain.

The Bureau of Mines has completed a survey of the quarries of the country which might constitute sources of material for stone dusting the five thousand or so coal mines in the United States. The Bureau, at its Pittsburgh station, offers to examine and report upon the suitability of any particular rock dust for the purpose. This is especially desirable in view of the fact that some classes of rock dust would establish a health menace.

Another advantage claimed for rock dust is its visibility, which greatly increases the illuminating effect of a miner's lamp instead of decreasing it by making the mine walls black, as watering does. This increased illumination should prevent many minor accidents along the passageways.

Latest News from Washington

The National Board of Highway Research Meets December 4 and 5. Statistics of Belting and Grindstones

By Our Washington Correspondent

THE Department of Commerce has just announced the 1923 biennial census figures for manufacturers of leather belting, grindstones and pulpstones, and graphite products.

Regarding leather belting the department says that the establishments engaged primarily in the manufacture of leather belting (used for the transmission of power) reported products valued at $37,845,830, an increase of 97.4 per cent as compared with 1921, the last preceding census year. In addition, leather belting was manufactured to a small extent as a secondary product by establishments engaged primarily in other industries. The value of the belting thus made outside the industry proper in 1921 was $573,158, an amount equal to 3 per cent of the total value of products reported for the industry as classified. The corresponding value for 1923 has not yet been ascertained.

Grind stone and pulpstone manufacturers for 1923 reported the production of grindstones valued at $1,193,511, of pulpstones valued at $640,536, and of other products to the value of $362,084, making a total of $2,196,131, an increase of 39.8 per cent as compared with $1,498,897 in 1921. In addition, grindstones and pulpstones are manufactured to some extent as secondary products by establishments engaged primarily in other industries. The value of such commodities thus produced outside the industry proper in 1921 was $31,294, an amount equal to 2.1 per cent of the total value of products reported for the industry as classified. The corresponding value for 1923 has not yet been ascertained.

Manufacturers of graphite reported products valued at $2,184,609, an increase of 49.9 per cent as compared with $1,456,864 in 1921, the last preceding census year. In addition, graphite is manufactured to some extent as a secondary product by establishments engaged primarily in other industries. The value of the graphite thus produced outside the industry proper in 1921 was $141,911, an amount equal to 9.7 per cent of the total value of products reported for the industry as classified. The corresponding value for 1923 has not yet been ascertained.

Saving up to $23,000 a mile on 80 per cent of the highways to be improved in the United States is the goal which the advisory board of highway research hopes will be attained in the near future. The executive committee of the advisory board met here Thursday, Oct. 18.

When it is stated that $1,000,000,000 is spent annually by the Nation on its roads the saving of $23,000 a mile on thousands of miles of highways will be seen to be an enormous economy in the use of taxpayers' money. The savings will be made, it is expected, by discovering some kind of surfacing which will carry secondary traffic at a cost, including road foundation work, of approximately $12,000 a mile. Concrete or asphalt roads cost $35,000 a mile for much of this traffic at present, so that the difference will be $23,000 if the discovery is made.

Announcement is made by the L. F. Owen Company of Chicago of the opening of a Central Purchasing Office for the Building Material Dealers of Chicago and surrounding territory. Its object will be the concentration of purchases of various commodities through one office, and "will stand for the reduction of costs, elimination of waste, standardization of materials and methods and uniformity of terms and contracts.

Jones Gears Catalog No. 29

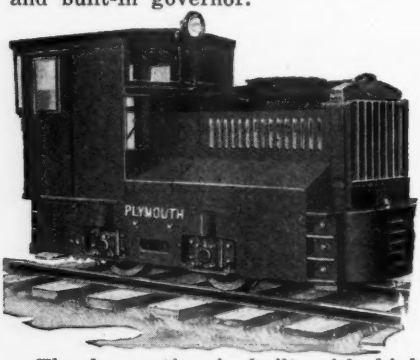
The "Jones Double Thrust Worm-Box" is a new product just placed on the market by the W. A. Jones Foundry & Machine Co., of Chicago. This is described in the new catalog No. 29, "Jones Gears."

This product is described as providing an accurate and rigid support for the worm shaft and holds a liberal supply of oil. There are finished thrust washers at both ends of the worm consisting of two steel and the center one of hard fiber. The bearings are babbited and bored, also faced on both ends. The boxes are made in standard sizes to suit standard cut steel worms as made by this company. They are recommended to be used with open Worm Gear Drives when something less expensive than a completely enclosed unit must be used.

New Plymouth Gasoline Locomotive

A new gasoline locomotive has just been brought out by the Fate-Root-Heath Co. (Plymouth Locomotive Works), Plymouth, Ohio, known as Model DLC, Type 6, weighing 8 tons.

This locomotive is equipped with Climax Model TU 4 cylinder engine, 5½ inch bore by 8 inch stroke, developing 65 H.P. at 900 R. P. M.; Bosch high tension magneto with impulse coupling; Simms 12 volt starter and Millard storage battery; Stromberg carburetor; United air cleaner and built-in governor.



The locomotive is built with high cab, height over all 84 inches, enabling operator to see over industrial cars. Speeds are 2½, 4, 8 and 12 miles per hour at engine speed of 900 R. P. M. The manufacturers speak of having received excellent reports from the development models during some lengthy work-outs under trying conditions.

General Motors Changes

Announcement was made today of the appointment of Mr. V. H. Day and Mr. B. M. Price as regional vice-presidents of the General Motors Truck Company. By reason of their long years of service both as executives and as members of the motor truck industry, both of the appointees are particularly well qualified for the important work that they are undertaking, officials of the company stated today.

Mr. Day will have headquarters at San Francisco and Mr. Price will be located in New York. They will assume their new duties September 15.

Mr. Charles H. Engelman, for many years wholesale manager of the New York territory of the General Motors Truck Company, has been appointed general sales manager with headquarters at the factory in Pontiac.

Osgood Bulletin No. 247

Under the title, *This Was the Start,* Osgood's new bulletin No. 247 shows a wood cut of the Osgood Railroad Type Shovel in 1880, which is far from being the crude awkward implement one would expect to see in that early day. Nine of these "land excavators," as they were called were used by Count de Lesseps in 1882-83 when the original French Panama canal was projected. The catalog describes early types of the Osgood and the development of this machine up to the present time. Copy mailed on request to the Osgood Co., Marion, Ohio.

The Carr "Dot" Lubricator

When the first pressure lubrication system was presented about four years ago, (says the Carr Fastener Company of Boston) it offered so many advantages over grease and oil cups, wick systems, etc., that it was instantly adopted. Among the various new lubricators put out since then the "Dot" System—named for the "Lift-and-Dot" and other fasteners used in the automobile industry, embodies attractive features.

Durability is claimed for it because the nozzle is one solid piece of hardened steel, it has a steel reinforced washer and steel nipples. It is high-pressure, progressive, and has direct connection, screw-thread engagement between nozzle and nipple. Requests for full information are invited.

The Care and Repair of Motor Trucks

By F. A. WHITTEN, Chief Engineer, General Motors Truck Company

TREATMENT given a truck during the first 30 days of its career often decides whether the black ink of the profit column or the red ink of loss will be used when a balance is struck of the truck's earnings. So the first 30 days are the hardest, from a truck's viewpoint.

Be sure that the radiator is full and is kept full of water; that good oil is up to the "full" mark in the oil reservoir and that it is changed in accordance with manufacturers' instructions. Register the storage battery at once at the battery service station so that the 90 day free service can be had, and have the battery inspected at least once a week.

With most make trucks it is advisable to drive them not faster than 15 miles an hour the first 500 miles so that the bearings will be worn in properly. With some of the better make trucks that have reamed bearings fitted with the proper running clearances built in by the manufacturer, and forced feed lubrication this is not necessary and the truck can be driven at governed speed at once.

Under no circumstances disturb the governor and its adjustments. This is set at a speed that means safety both for the truck and traffic. A faster speed invites mechanical trouble and road accidents.

After a truck has been run a few days, look it over closely. See that brakes have a full bearing surface on the drums, as new brakes often have high spots which wear down and leave the brakes loose. See that radiator hose connections are tight and that all nuts are well fastened.

The truck owner who would get the ultimate of service from his purchase, and who has civic regard for the condition of roads will not overload his truck. An overload may mean a slight increase in a day's profit, but it is likely to result in big expense bills through the premature wearing of parts. It also is a big factor in injuring road surfaces. The wisest course is to obey the rated load rule and the state laws governing loads on highways.

Keep the working parts of the truck clean and well lubricated if the maximum results are desired. A dirty engine has a bad moral effect on the driver, and indicates lack of care. From a purely mechanical standpoint it aids dirt and grit to work into moving parts of the engine, covers small parts such as cotter pins so thoroughly that it is not easily noticed if they fall off, and generally proves detrimental. Furthermore a dirty engine collects oil, creating a fire hazard.

One half of the secret of reducing gasoline and oil bills is to each day check the miles traveled by the truck, fill up the gasoline tank, recording the amount put in it, and then figuring the miles per gallon obtained. The second half is still easier—it consists of having some one interested in the operating cost of the truck to look at this daily record.

A truck in good condition will operate under normal loads and over average roads, at, say, 10 miles to the gallon of gas. This will be shown on the daily record. But a constant inspection of this record will disclose that gradually or perhops suddenly only five or six miles are being obtained for each gallon of gas. The record proves a barometer that gives warning that something is wrong and that an inspection is required at once.

Sometimes dragging brakes may be responsible; again it may be that the carburetor requires readjustment. or tires may be worn so badly that they no longer are economically useful. Whatever the fault is attention is called to it, the trouble located and rectified, and the gasoline consumption reduced materially.

If this daily check is not made and watched, the trouble goes unnoticed until sometime later when the unusually large operating costs are questioned or there is a general overhauling of the truck.

In practically all cases where too much gas is being used there is a corresponding wastage of oil. When the mixture is too rich the oil is being diluted and its lubricating value lost. Where brakes drag, more power than should be required is used with the extra consumption of oil.

Keeping gasoline mileage records, and watching them, will save a truck owner a substantial amount during the year, and also will be of value to him in getting a true picture of what his trucks are costing him to operate.

Whenever anything is wrong with an engine, the power plant will make it known in an unmistakable manner. Its audible noises are its method of making known that all is not well. Some of these noises are readily recognizable and the average driver knows at once what the difficulty is and, frequently, how to cure it. If he cannot locate the trouble, take the engine to a "doctor" at once. Instant attention likely will save a much larger repair bill and the expense of a lengthy layup of the truck.

Most engine ills are caused by dirt and improper lubrication. Good oil should be purchased from a reliable concern and used regularly. If the engine is kept clean any leak in the lubricating system can be detected at once. This is but one of the many reasons why a truck engine should be kept scrupulously clean.

Some motor trucks now on the market are equipped with air cleaners. These, by removing the dirt and grit from the air before it goes into the carburetor, greatly lengthen the life of an engine. Tests have shown that the greater part of the so-called carbon in cylinders is composed of silica, or road dust. These dirt particles hold the unburned atoms of oil to the walls of the cylinder and help carbon collect. They also enter the lubricating oil, scoring cylinders and wearing bearings.

One of the sources of engine trouble is due to worn cylinder walls. These wear most at the top, causing the cylinders to become tapered and, therefore, permitting oil and gas to leak past the piston rings. A lengthy, and costly, operation of reboring and the use of oversize piston rings are required where the cylinder walls are cast en bloc.

On a few makes of trucks removable cylinders are used. In the latter case a new sleeve, or wall, can be quickly inserted when necessary. These sleeves also keep perfectly round longer as they are of one thickness throughout their entire circumference and, when heated, expand in a circle.

In many localities in this country trouble is experienced by truck engines heating after they have been in use some time. This is due to alkaline water used in the radiator which forms scale and prevents full circulation of water. It can be prevented by using boiled or soft water in the cooling system.

Drivers should retard the spark whenever a fuel knock is heard and advance it when conditions no longer require it. Engines should not be allowed to idle for long periods. The small trouble of starting the motor will be more than repaid by better engine performance. Use air cleaners and keep the engine clean. This latter is most important and can be accomplished by wiping off the engine daily with a clean rag.

Never "coast" your truck down a hill. By this we mean do not descend a hill with a truck, loaded or empty, with your clutch disengaged.

By leaving your clutch engaged your motor assists in braking the truck and also relieves the brakes themselves of part of the strain and helps keep them from "burning." It is also better not to shut off the ignition because if you do so on a long hill, the excess gas which accumulates during the descent may cause an explosion of sufficient force to ruin your muffler when the ignition is turned on again at the bottom of the hill. In addition it causes the carbon to form quickly.

"Coasting," in many states, is against the law because it is conducive to traffic accidents due to the fact that a loaded truck may burn out its brakes or attain such a speed as to get beyond control on a steep hill. In addition reengaging the clutch with the truck traveling at high speed can do almost irreparable damage to a truck. Most motor truck engines are governed at a specified speed. If a truck traveling down a hill with clutch disengaged attains a speed of 35 to 40 miles per hour and its engine is governed at say 25 miles per hour, imagine what will happen if the clutch is reengaged with truck and engine running at these respective speeds.

If the load is sufficiently heavy the entire driving mechanism may be torn out of the truck, or the least that may happen is the ruining of one of the propelling units.

Care should be taken in gear shifting. The driver should "keep up the momentum" of his truck in heavy going. He should never let the speed of his truck diminish to the "laboring" point before he shifts. The purpose of the transmission is to provide locomotion under all road conditions and failure to "shift" when it is necessary causes unnecessary strain.

The proper use of the clutch in the operation of a motor truck will

assure you against breakage or overstrain in rear axle gears.

The operator who allows his clutch to drop back to instant contact may strip his rear axle gears. The same accident may occur in "coasting," which, as we have previously noted is equally dangerous to the transmission.

Lubrication again is an important factor. "Oil is cheaper than machinery" is an old adage which applies to every part of the truck. The use of a heavy fluid oil or a selected non-fluid oil is recommended. The term "600 W" is usually understood to mean a rear axle oil and your garage man will most likely know exactly what to give you if you ask for it, in case you are not using a specified brand.

Oil should not be allowed to work out into the brake bands. Such a condition may cause your brakes to become useless at just the time you need them most. Gaskets, or whatever contrivances are used to prevent this flow of oil to the brake bands, should be renewed by your repair man.

Rear axle gears do not need frequent adjustment. However, after the truck has been in use for a long period, a noisy axle may develop due to the gears getting out of pitch line or to bearing wear. Adjustment should then be made to eliminate noise and wear incident to this condition. This is particularly necessary in motor buses where the minimum of operating noise is desirable.

The above discussion of adjustments refer to bevel and worm gear type of axles which are in most common use. Chain drive trucks require more frequent adjustment. The chains should be adjusted often enough to avoid "whipping" and lost power due to excessive slack, and to avoid breakage.

Care should be taken to get this adjustment even on both chains or a noisy roaring chain will result with uneven pulling and excessive wear.

If motor truck operators would give more attention to chassis lubrication, it would result in longer life and better operation of their trucks. The average truck operator observes the ordinary precautions in engine lubrication but often neglects his chassis which requires consistent, and at many points daily attention. In engine lubrication we will touch only upon points which are most often overlooked by the operator.

On cold mornings the engine should be warmed slowly because the oil is thick and while your oil pressure gauge may show a high pressure when the motor first starts, if you will watch it, you may see it fall back almost to zero due to the oil being too cold to pass through the screen readily. Get the habit of watching the oil pressure gauge. It is an index to the engine lubrication system. Oil should be changed every 1,000 miles or more often. Many operators run 2,000 miles successfully on a supply of oil but the first figure is recommended for any make of truck.

The use of an air filter will keep road dust from working into the engine and consequently add to the life of oil and the engine's working parts.

The changing of oil regularly, however, can be considered one of the most important points in lubrication, because the very nature of the use of oil necessitates its renewal at regular intervals.

Overloading of trucks is the big cause of excessive tire wear. Perhaps no part of the truck is subjected to greater strain on overloads than the tires.

Where pneumatics are used this practice does as much damage to truck tires as a complete disregard of the rules of inflation. With regard to the latter subject, the tire manufacturer's instructions on inflation of truck tires should be observed consistently. Overinflation is, in most cases as dangerous as under-inflation.

Even braking is necessary to obtain maximum wear from tires. Assuming brake pull-rods are adjusted to give even pull, the proper place to make first adjustment is at the brake band or shoe, not at any other part of the mechanism. Regular inspection of brakes is necessary and an even contact of the band at all points is requisite in good adjustment. Uneven contact of brake bands is the cause of "chattering" when brakes are applied.

A severe shock, such as results in striking a curb, may spring the knuckle tie rod, thus throwing the front wheels out of proper alignment. This results in hard steering and excessive wearing of tires, either solid or pneumatics. In a case which recently came to my attention an operator completely ruined a pair of pneumatic tires on a fifty mile drive after a slight accident.

The front wheels should not be lined up exactly parallel. Tie-rod

adjustments should produce a "toe-in" of one fourth to one half of an inch in the front wheels.

Lubrication of all steering gear connections, including steering knuckles, at regular intervals, is necessary. The majority of "hard steering" complaints are due to a lack of lubrication. "Lost motion" in the steering gear should be kept at a minimum but without causing binding at any point in the full travel of the wheel.

Crusher Service

It will be of interest to users of Symons Disc Crushers to know that the same Engineering, Manufacturing and Selling Organization that invented, made and introduced the Symons Disc Crushers are again following their old policy of giving special attention to their machines after they are installed. They are fully convinced that the best way to advertise is through satisfied customers. They believe in stating accurately as possible the actual capacities, power required, etc., and giving data that can be relied upon for plant designs and specifications. They stand behind any statements made in their catalogues or in their advertisements in PIT AND QUARRY.

100 and 1 Ways to Save Money With Portable Air Power

A new seventy-two page book with the above title has been issued by the Ingersoll Rand Company, 11 Broadway, New York City.

It is a complete and up-to-date description of portable air compressors and the many air tools and labor aiding methods made possible by them. It contains many new applications which we believe have never before been illustrated and described.

Wherever possible cost data comparing hand versus machine methods are given. There are over one hundred illustrations showing various applications. An index in the back facilitates quick reference.

The book describes the use of such tools as the "Paving Breaker," "Jackhammer," "Little Trigger" Hoist, Rock Drill, Trench and Clay Digger, Backfill Tamper, Pneumatic Drill, Cement Gun and many others.

The New York office of Smith Engineering Works of Milwaukee, Wisconsin, has been changed from 50 Church street, New York City, to 18 East 41st street, New York City.

Two Austin Publications

Two new publications are announced by the Austin Manufacturing Co., of Chicago, one a catalog describing the Austin Leaning Wheel Grader, the other a circular on their new Power Grader.

Leaning Wheel graders have been made and sold for the past 35 years. The Austin Manufacturing Company, long builders of standard wheel graders, have finally added the leaning wheel feature to their grader for the benefit of those who believe there is a virtue in this type. The catalog describes at length the superior features of Austin construction: the long telescopic rear axle; axles made either longer or shorter than any other leaning wheel grader, and axles of any desired intermediate length; Timken Tapered Roller Bearings; Alemite High Pressure Lubrication; blade lowering, raising and side-shifting mechanisms; strong front truck; steerable offset engine hitches; back sloper; double-ender; and many engravings which illustrate these and other machines in the Austin line.

The circular on the Austin Motor Grader contains eight pages. The purpose of a grader is to remove all inequalities in a road surface by cutting off high spots and filling in low spots. To handle such a machine efficiently the operator must be in a position to distinguish between high spots and low spots, and to see them early enough to enable him to make the necessary changes in the blade to meet what is coming. The operator of an Austin Grader is located so as to see all this without being obliged to move his head continually backward and forward. On the Austin Motor Grader all the adjustments of the blade, vertically, diagonally and laterally, are made by the operator from his place on the machine, without being obliged to climb down and out to do it by hand.

Copies of these publications may be had on request.

Bucyrus Choice of Power

The Bucyrus Company of Milwaukee, Wisconsin, now offers its three sizes of small revolving shovels and dragline excavators operated by steam, electricity, gasoline or Diesel power unit. This wide choice of power adapts the machines to every possible operating condition. The electric machines may be had for either AC or DC current. The Diesel machine operates at a very low cost.

New Link-Belt Loader

In some sections of the country, such as New England, suitable sand and gravel for road work are found almost adjacent to the main highways. The amount of aggregate necessary for highways, whether of the penetration or reinforced concrete type, does not justify the installation of a large plant. Often the work is ten to twenty miles distant from an established pit, which makes trucking charges for sand and gravel almost prohibitive.

This condition, says the Link-Belt Company of Boston, has created a demand for portable machinery. In the accompanying illustration a Link-Belt "Cub" portable belt conveyor is shown in operation at the pit of J. Colombo and Sons, Dedham, Mass. The design of these loaders or conveyors, they say, makes them admirably suited to the handling of brasive materials because of the troughed conveyor belt and the absence of skirt-boards.

The machine, with two men at the foot end, pushing the material down the bank—which method gives a most uniform feed—loads at the average rate of one cubic yard per minute. At established pits longer lengths of portable belt conveyors are in demand. A 60-foot belt conveyor as standard equipment permits the continuous operation of the plant throughout the summer, the excess production going into storage for winter use.

In almost every case these belt conveyors are powered by an electric motor, but where this is not available they can be equipped with gasoline engines.

Republic Truck Appointment

The Republic Motor Truck Co., Inc., Alma, Mich., announces the appointment of Robert S. Taylor as distributor for Republic motor trucks in Seattle, Wash. A complete stock of parts for all models will be kept on hand at all times. Other distributors are located at Long Beach, San Diego, Los Angeles and San Francisco, Calif., and Portland, Ore., and Spokane, Wash.

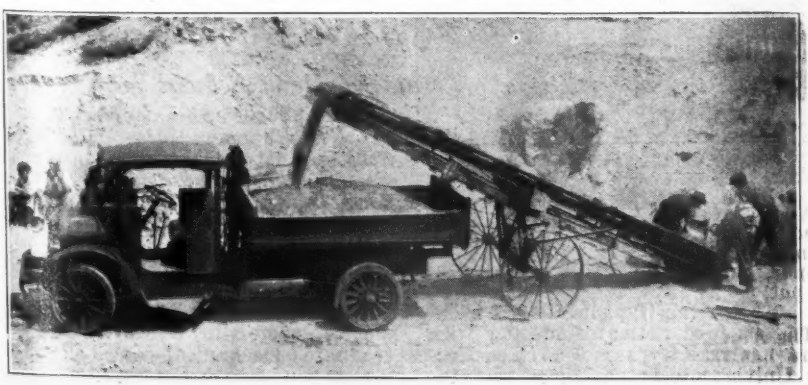
Two New Byers Bulletins

A new 24-page bulletin issued by The Byers Machine Company of Ravenna, Ohio, describes the Byers Model 10 Crane, a full revolving crane of 10 tons capacity embodying high grade features of construction and engineering. This is the largest of the Byers line.

A second bulletin of 16 pages describes the Truckrane, which is a light crane furnished unmounted on a motor truck chassis. Both bulletins are profusely illustrated with view of actual operation under various conditions, and are mailed on request.

New du Pont Bulletin Series

A series of bulletins on the safest and most efficient methods for using explosives, known as Explosive Service Bulletins, based on the experience of its experts, is being issued by E. I. du Pont de Nemours and Company of Wilmington, Del. Thirteen of these have been issued to date. Another interesting bulletin issued recently by this company is entitled "What Happens When Dynamite Explodes?"



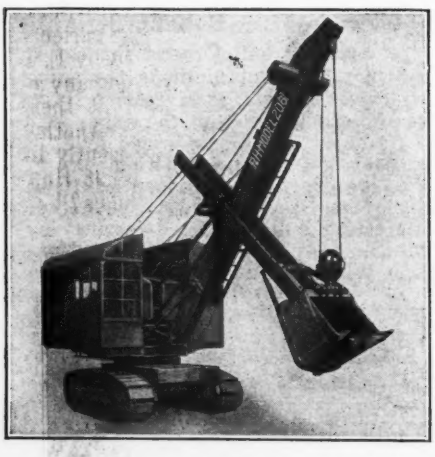
The New Link-Belt Loader In Action.

Sauerman's Pamphlet No. 24

Pamphlet No. 24, just issued by Sauerman Bros. of Chicago, recounts the story of Sauerman Power Drag Scrapers' performance on many new operations in various parts of the country. There are 32 pages, profusely illustrated, giving the story of the development of the Sauerman bottomless power scraper, method of operation, maintenance cost, power requirements, table of handling capacities, full equipment, small and medium and large sand and gravel pit operations, stripping of over burden, making cuts and fills and grading and many other operations.

P. & H. Improvements

The Pawlings and Harnischfeger Co., of Milwaukee is now equipping all of its ½ yd. and ¾ yd. excavators with a specially designed all-steel cab, thereby adding to neatness of appearance and assuring complete protection of all the main machinery from the weather. The cab has windows on each side, giving the operator full view of operations, and a swinging steel door at each side gives full access to the machinery.



Another new feature now being used on all P. & H. Model, 206 Machines, is the ¾ yd. struck measure dipper, said to substantially increase output.

The American Gypsum Co., of Delaware has filed notice of merger with the Universal Gypsum Co. The Secretary of State is named representative in each case.

Foote Bros. Gear Bulletins

The Foote Bros. Gear & Machine Co., of Chicago, has prepared a new bulletin entitled "Foote IXL Flexible Couplings," to contain much valuable and instructive information on the use of flexible couplings for practically every purpose, from smallest to largest.

The new Speed Reducer catalog announced in a previous issue, has been delayed to permit the incorporation of additional accumulated material. It will contain 96 pages, treating in detail the many applications of speed reducing equipment to material handling equipment and to many manufacturing operations in nearly every industry. Both catalogs will be sent free on request.

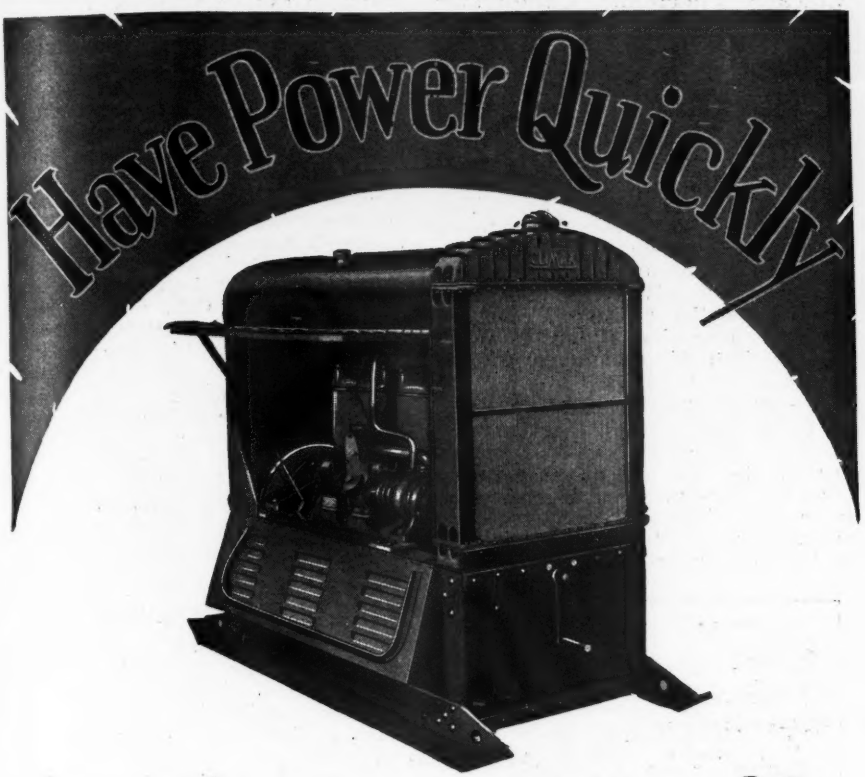
The Acme Automatic Loader

The Acme Automatic Loader is used on all classes of work wherever a slip is ordinarily employed. There is no need to build a tunnel or bridge trap. In grading work and all road work, especially in shoulder drainage, gravel pits or excavation work of a hundred kinds the Acme is described as the best that money can buy.

The advantages of the Acme Loader are classed under three heads: 1—Short Hauls—No Added Expense. 2—Adaptable to Quick Location Change. 3 — Eliminates Motor Troubles. Short hauls are possible, the machine is adaptable for speedy change of locations, and it can be moved whenever and wherever it is needed. The weight of the machine is 1,900 pounds; it will carry a lift of 2,000 pounds. Additional information will be furnished on request by the Acme Foundry & Machinery Co., Coffeyville, Kansas.

Woolfenden Joins Scott Valve

H. L. Woolfenden, formerly with the Allis-Chalmers Mfg. Co. of Milwaukee, District Manager, in charge of sales and engineering work in the Rocky Mountain District, has joined the Scott Valve Manufacturing Co. of Detroit, Mich., where he will have charge of Sales Promotion. In earlier years Mr. Woolfenden was a consulting engineer in Detroit and engineer-contractor in Denver. He is a graduate mechanical and electrical engineer with degrees from the University of Michigan.



Anywhere you need it

No special foundation required. No time wasted. No shut-down necessary. No expensive delays when other power fails. The skid-sled base with handy hook-on holes allows you to slide the Climax "Trustworthy" Power Unit to any job for inside or outside use. Hook up directly or belt up to

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The "Trustworthy" Power Unit

and have plenty of power for pumping, hoisting, crushing, grinding, operating generator, driving machinery, etc.

The small investment required will be saved many times over by the always-ready emergency service this Unit will give.

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Jackson, Miss.
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Little Rock, Ark.
Los Angeles, Calif.
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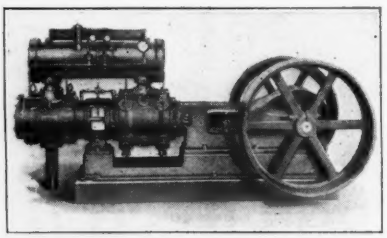
Nashville, Tenn.
New Orleans, La.
New York, N. Y.
Oklahoma City, Okla.
Omaha, Nebr.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
St. Louis, Mo.
San Francisco, Calif.
Seattle, Wash.
Tampa, Fla.

Chicago Pneumatic Compressor

In order to secure the advantage of such low power consumption per cubic foot of air delivered and the favorable physical conditions of the air resulting where two-stage compression of 500 cubic feet piston displacement or over is used, without the heavy initial cost of the compressor and of the installation, which over-balance the favorable features, the Chicago Pneumatic Tool Company of New York has developed a machine of smaller displacement. This machine is the Chicago Pneumatic Straight Line Two-Stage Belt or Motor-Driven Air Compressor known as the Class N-CTB.

The Class N-CTB operates at 275 R. P. M. and has a piston displacement of 360 cubic feet of free air per minute. The air pressure range is up to 125 pounds, and it is adapted to be driven by a belt or a synchronous motor with rotor mounted directly on the compressor crankshaft.



The Chicago Pneumatic Compressor.

Tandem construction is used in this unit in which the low pressure cylinder is placed next to the frame and the high pressure cylinder is connected to the low pressure cylinder by a tandem piece. The whole unit is mounted upon a substantial rigid subbase, and perfect alignment is assured. This feature gives the unit a degree of portability not realized in duplex construction, and will therefore appeal to those compressed air users who frequently employ semi-permanent installations.

The whole compressor unit is said to be marked for its simplicity and perfect accessibility and ease of adjustment. Simplex valves are used throughout assuring high efficiency. Automatic operation is attained to a high degree. Regulation of the volume of air and its pressure is entirely automatic and can be furnished to conform to special conditions.

Automatic start and stop control operation can be employed when the compressor is driven by an electric motor when the demand and supply of air is intermittent during the day. If the compressor is by electric motor and air demands are for long intermittent off-and-on periods, a combination of the two systems above described can be employed to advantage, and either one can be thrown into operation in a few seconds.

The Chicago Pneumatic Tool Company, have entered into an agreement with the Schurs Oil Burner Company of Los Angeles, Cal., whereby they have become United States distributors for Schurs Oil Burners for brick, tile, sewer pipe and potteries industries. To insure prompt execution of orders the Chicago Pneumatic Tool Company carry a liberal stock of burners at their 17 Branch Service Stations. Trial installations will be made for those contemplating installation of oil burners to prove the reliability and economy of said equipment.

Telsmith Crushers

The new Telsmith Bulletin No. 261D, describing Telsmith Primary Breakers and Telsmith Reduction Crushers, has just been issued by the Smith Engineering Works of Milwaukee. This 20-page book illustrated with beautiful engravings, gives the up-to-date story of Telsmith crushing and reducing machinery.

All Telsmith crushers, primary and reduction, are equipped with steel frames, steel crowns and unbreakable pillar-shafts, and are guaranteed against breakage for two years from shipment provided users follow instructions. Telsmith breakers and crushers are described as fool-proof and unbreakable. In the improved types shown Telsmith's inherent strength is doubled by the substitution of steel frames instead of iron, so that it is claimed even tramp iron is now powerless against Telsmith equipment.

The new bulletin 264-A describes the Telsmith Jaw Crusher, which is furnished either as a mounted or a stationary rig. This crusher is a heavy duty machine of the direct stroke type. As in the primary and reduction crushers, both the frame and swinging jaw of the Jaw Crusher are of cast steel, as a precaution against destructive tramp iron that sooner or later finds its way into every crusher. Telsmith Portable Rigs are also described and illustrated.